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FROM

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GERMAN EDUCATIONAL EXHIBITION

WORLD'S FAIR ST. LOUIS 1904

Prussia – Ministerium d. geistlichen,
unterrichts- und medizinal- angelegenheiten.

Universities

and

other Scientific Institutions

BERLIN 1904
PRINTED BY W. BÜXENSTEIN

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In order to fully understand and appreciate the essential nature and characteristics of the German educational system, not only must the historical development of the system from century to century be studied, but a living and personal observation of the work of the actual system in all its grades must be undertaken. Although this object cannot be realised in this exhibition, since, apart from the question of the extent and expense of such a representation, neither the instruction itself nor its development are adapted to direct demonstration, yet, as proved especially by the experiences of the German Educational Exhibit in Chicago 1893, there is some hope that it will be possible, even within the limits prescribed by circumstances, to give the large circle of visitors to the exhibition some idea of the methods, arrangements and results of our System of Education as a whole.

Certainly a deeper penetration into that many-branched organism of the written word is not to be dispensed with. For that reason the attempt has for the first time been made, in the work "Das Unterrichtswesen im Deutschen Reich" published for the exhibition by Geh. Reg.-Rat Prof. Dr. Lexis in Göttingen with the co-operation of numerous professionals, to give a comprehensive idea of all branches of instruction as it has developed under the direction of the various German Federated States.

The contents of the German Educational Exhibit must only be regarded as a selection of typical demonstrations intended to represent our Educational System as a whole. It was of course out of the question to aim at any sort of completeness, and it seemed to us all the more proper this time to lay especial weight upon the detailed representation of separate departments, in that the German Educational Exhibit in Chicago, which will probably still be in the memory of many of those visiting the present exhibition, presented rather a general survey of the whole system than a detailed consideration of the separate branches of instruction.

Of the greatest importance for the true understanding of our system is the inner connection of the various stages of instruction, from the Board Schools and Colleges up to the University, the Technical Colleges and the Colleges for separate professional branches. By the combined means of the University and the other related Colleges which, besides imparting instruction, are intended to cultivate scientific investigation, education attains the highest aims of science. In this exhibit, therefore, the Deutschen Akademien der Wissenschaften (German Academies of the Sciences) could on no account remain unrepresented as incorporating the organisation of scientific work. These institutions, like the Universities and Technical Colleges, have from time out of mind, on account of their peculiar development and individual character, excited in a high degree the interest of foreign countries. Thus it will be understood that in the following description also they find a foremost place.

For the rest, the natural and medical sciences furnish far more material for exhibit-articles than do the humanistic sciences. The exhibit of the German Universities and Technical Colleges has therefore, from the manifold branches of science pertaining to their various fields of instruction, been obliged to give consideration before all, as the following paragraphs show, to natural-sciences and medicine (chemistry, physics with astronomy, etc., zoology, botany, medicine). Although the humanistic sciences are thereby apparently left in the background of the German Educational Exhibit, yet a glance into the collection of the publications proceeding from the German Academies which fills the Court of Honour, will show that these departments in the work of German science are by no means neglected. Moreover in the annexes to the Court of Honour the specimens of the German excavations now proceeding (Saalburg, Babylon, Baalbek, Abusir, Miletus and Priene) as well as the large-sized photographs, most useful too as aids in art-instruction, stand as evidence that a special department exists for these sciences. A right understanding of this question is, however, best given by the previously mentioned comprehensive work upon the German system of instruction, in which book the work of the German Universities, in these departments as in others, is discussed in detail, and which furnishes extremely useful information in a multitude of other questions concerning our educational institutions.

In accordance with its object the exhibit falls into two large departments, of which one comprises the German Universities, Technical Colleges, and other Scientific Institutions, and the other Higher Education and the Public School System as a whole. Among the branches of science represented in the first department, in addition to Medicine, Chemistry and the Physical Branches of Science (represented mainly by scientific instruments) are before all prominent in the exhibit, for which reason special catalogues have been devoted to them. The catalogue of the German Educational Exhibit consists of five parts:

I. Universities and other Scientific Institutes.
II. Medicine.
III. Chemistry.
IV. Scientific Instruments.
V. Elementary and Advanced Education.

It is to be remarked that owing to space considerations the whole exhibit, with the exception of Chemistry, has been placed in the Educational Building; Chemistry, on account of the great total extent of the German Educational Exhibit (about 4400 square meters) has had to be exhibited in the Electricity Building. This arrangement does not, of course, in any way interfere with its close connection with the main part of the exhibit.

The preparation of the exhibit lay in the hands of the Prussian Education Department, which however, was greatly assisted by official institutes of the other States of Germany as well as by the ready kindness of numerous institutes, corporations and private individuals from all parts of the Empire.

For the larger groups of the exhibit, where separate officials did not undertake the preparation, special committees were instituted (especially for Chemistry, Mechanics, Optics and Medicine), whose members have, within the limited time at their disposal, devoted themselves most self-sacrificingly to the preparation of the exhibit.

Through the grant put on the Prussian estimates for 1903 and 1904, funds to the amount of 350,000 M. were placed at their disposal. For the rest the expenses, not to mention the State grant, have been partly covered by contributions from the exhibitors themselves. We must allude with especial gratitude to the sum put at our disposal by the Chemical Manufacturing Industry.

A mark of the highest distinction has been paid the German Education Exhibit, in that His Majesty the

Emperor has condescended to accept the dedication to himself of the work on the Educational System in the German Empire which has been published in connection with the Exhibition, and to honor with his presence and interest the trial exhibit in Berlin of various parts of this undertaking.

The exhibit of the Universities, Technical Colleges and other scientific institutions to which the present volume of the catalogue is devoted, is, as has already been emphasised, supplemented and interpreted by the work published by Geheimer Regierungsrat Prof. Dr. Lexis, viz "Das Unterrichtswesen im Deutschen Reich", especially in its first and fourth volumes. By means of it even the foreigner may acquire a thorough understanding for the highest stages of instruction and the organisation of scientific investigation in Germany. This work has, therefore, been placed near the entrance of the exhibition, in the Court of Honor which contains the bust of this Majesty the Emperor. The English translation of this work (also exhibited in the Court of Honor) viz. A general view of the History and Organisation of Public Education in the German Empire is intended to have a very wide circulation, and will, let us hope, prove itself adapted to give the necessary information to those who desire not so much a scientific insight into as a practical general survey of our educational arrangements; it may also, owing to the convenient arrangement of the material, serve as a starting-point and foundation for more particular study.

Besides these publications, which are of such extreme value for the whole educational exhibit, the writings of the German

Akademien der Wissenschaften (Academies of Science) have been exhibited in the Court of Honor. If anything at all is significant of the advance of sciences in Berlin, it is the fact that, besides the Universities which have for centuries been the head of scientific instruction and the centre-point of scientific investigation, the Academies of the Sciences, which likewise have centuries of history to look back upon, and which, though not intended for actual teaching, have, from meetings of their members for mutual exchange of opinions upon scientific questions, gradually assumed the form of organisations for carrying on scientific investigations on a large scale, able, as it were, to step in with their united energy where the power of the single investigator proves unavailing, no matter whether the scientific problems to be solved demand the organised co-operation of a number of savants or surpass the limits of a single human life. As examples of such undertakings we may mention from the sphere of work of the Berlin Academy, the Corpora inscriptionum latinarum and graecarum, the edition of Aristotles and of the Grecian commentaries on Aristotles, the edition of the works and political correspondence of Frederick the Great, the memoirs of the Prussian State Administration of the 18th century (Acta borussica), the Monumenta Germaniae historica in connection with the Academy, the publication of the Christian Greek authors of the first three centuries, the edition of the Ibn Saad, the edition of Kant's works and the edition of the writings of great mathematicians, of the Corpus nummorum, of the natural-scientific account of the whole of the animal and vegetable kingdoms, and of the Thesaurus stellarum affixarum. It is gratifying to think that the understanding for the significance of the Academies as leading organs for comprehensive undertakings on a large scale is beginning to gain ground in other countries. Moreover, just as the German Aademies united in the first place for mutual work, so now in modern times the

Academies of the Fatherland and of other countries, mainly owing to German influence, have joined forces in an International Association of Academies.

As a supplement to the literary work of the Academies, some specimens of the various excavations at present being undertaken by Germany have been placed on exhibition. They cannot, nor are they meant to, give even an approximate representation of the success of these researches; they nevertheless give a hint of the manifold nature of the efforts put forth in this sphere of science. The restoration of the Saalburg, the most important of the old Roman citadels still extant on German soil, is the only case in which a complete picture of the whole is presented to the eye by means of models, imitations and plans of the discoveries made, and this fact is due only to the initiative of His Majesty the Emperor, whose protecting hand guided the restoration works to their completion.

The two adjacent halls are principally meant to give, by means of selected views, plans and graphic diagrams, somewhat more detailed pictures of parts of our Universities and Technical Colleges, and the whole domain of the other exhibits in connection with Higher Education is, as we implied at first, devoted to individual departments of science. If no strict separation has here taken place between the part played by Universities, by Technical or other Colleges, and by the labours of individual savants or practical investigators, it must be understood that this corresponds to the character of our scientific studies, which, even when they aim at practical results, always rest upon the foundations laid in the Universities, Colleges and kindred Institutes and may, therefore, in their totality be regarded as a result of the effectiveness and thoroughness of the German Universities. That these special exhibits, above all those of chemistry, scientific instruments and of medicine, which form the main part of the exhibit of the

German Universities may find thorough appreciation and that they may also give foreign visitors a thorough understanding for the importance of science in the life of the German nation, is the great wish and hope of all those who have shared the labours connected with the preparation of this exposition.

The Court of Honor

Bust
of His Majesty the Emperor and King.

By Professor Manzel of Berlin.

The Educational System in the German Empire.

By W. Lexis, in co-operation with numerous education specialists. For the St. Louis World Exposition.

a) German Edition:

Vol. 1. The Universities in the German Empire.

Vol. 2. The Higher Educational Institutions and the System of Education for Girls in the German Empire.

Vol. 3. The Board School System and the System for training Teachers in the German Empire.

Vol. 4. Technical Education.

1. The Technical Colleges in the German Empire.
2. The Colleges for special Professions in the German Empire.
3. The middle and lower Special Instruction in the German Empire.

b) English Edition:

A general view of the history and organisation of Public Education in the German Empire.

Academies of Sciences

We have already referred to the importance of the German Akademien der Wissenschaften (Academies of Sciences): in these Academies are brought together the most prominent representatives of all the departments of knowledge cultivated by them, and here too, are collected together the results of investigation and research; the Academies, moreover, furnish powerful stimulus to new research, they organize far-reaching works, which are beyond the powers of one individual, they supply material aid in the execution of undertakings which involve great expenses, and enable works to be published which would otherwise remain unpublished owing to the expense entailed. They are all situated in University towns, and are closely connected with the respective Universities, inasmuch as their members are for the greater part Professors of the latter.

The Academies are as follows: In Prussia 1. The Royal Academy of Sciences in Berlin, founded in 1700. It has a physco-mathematical class and a philosophico-historical class with 60 members, besides outside corresponding and honorary members. The amount of the annual expenditure, without taking into consideration the income from numerous foundations and bursaries connected with the Academy: 231000 M. 2. The Royal Association of Sciences in Göttingen, founded in 1751, with a physico-mathematical and a philologico-historical class, each consisting of 15 members; besides outside corresponding and honorary members, — annual expenditure 26700 M.

In Bavaria: the Royal Academy of Sciences in Munich, founded in 1759, consisting of a philosophico-philological, a physico-mathematical and an historical class. Annual estimate: 80000 M. In connection with the Academy is the General

Conservatorium of the Scientific Collections of the Slate, to which most of the University Institutes belong.

In Saxony: the Royal Association of Sciences in Leipzig, founded in 1846, with a physico-mathematical and a historico-philological class. It receives an annual grant of 20000 M. from the Government.

Writings of the Academies of Sciences.

A. Publications of various Academies.

Thesaurus linguae latinae.

Compiled by the Berlin, Göttingen, Leipzig, Munich and Vienna Academies, begun in 1893. To consist of 12 vols. of 1200 folio pages. Exhibited are the 11 parts of the 1st and 2nd vols., which have appeared at intervals from 1900 up to the present day.

Encyclopaedie der mathematischen Wissenschaften.

Compiled by the Göttingen, Munich and Vienna Academies. To consist of 6 vols., appearing since 1898. Exhibited are the parts which have appeared up to the present, in 3 vols.

B. Royal Prussian Academy of Sciences in Berlin.

Abhandlungen der Königlich Preußischen Akademie der Wissenschaften.

The series has been appearing since 1710, up to 1743 in Latin under the title of "Miscellanea Berolinensia", 1745—1804 in French, under the title of "Histoire" or "Mémoires", and also, since 1788, in German as "Abhandlungen". Exhibited are the annual vols. 1860—1902, in 43 vols.

Monatsberichte der Königlich Preußischen Akademie der Wissenschaften.

Appeared 1836—1881; exhibited are the annual vols. 1860 to 1881. Continued under the title:

Sitzungsberichte der Königlich Preußischen Akademie der Wissenschaften.

Since 1882, exhibited in the complete series.

Corpus inscriptionum graecarum. Vol. 1—4. 1828—77.

Inscriptiones graecae.

New edition of a part of the contents of the Corpus inscriptionum graecarum. Is intended to contain in 14 vols the inscriptions of the Turco-Grecian Peninsula, of the islands of the Aegean Sea, Crete, Italy, Sicily. Exhibited are the vols. ready up to the present: vols. 1—3 (Attica), 4 (Argolis), 7 (Megaris, Boeotian), 14 (Sicily, Italy).

Corpus scriptorum historiae Byzantinae. 50 vols. 1828—97.

Aristotelis opera. Vol. 1—5. 1831—70.

Oeuvres de Frédéric le Grand. Vols. 1—30, Table and plans. 1846—57.

Corpus inscriptionum latinarum.

Complete collection of all Latin Inscriptions extant appearing since 1862. All the vols. (33) published up to the present have been exhibited. The undertaking is now almost finished.

Preußische Staatsschriften aus der Regierungszeit König Friedrichs II. (Prussian State Documents from the Reign of King Frederick II.) Vols 1—3. 1877—92.

Political Correspondence of Frederick the Great. Vols. 1—29. 1879—1903.

The vols. published up to the present extend to the year 1770.

C. G. J. Jacobi, Collected works. Vols. 1—7 and Suppl.-Vol. 1881—91.

J. Steiner, Collected Works. Vols. 1 and 2. 1881. 82.

G. Lejeune Dirichlet, Works. Vols. 1. 2. 1889. 97.

K. Weierstraß, Mathematische Werke. 1894, et seq. Up to the present 4 vols.

Commentaria in Aristotelem graeca. 1882 et seq.

The undertaking is now almost concluded, and all that has been published up to the present is here exhibited in 22 vols.

Supplementum Aristotelicum. Vols. 1—3. 1885—1903.

Acta Borussica. Denkmäler der Preußischen Staatsverwaltung im 18. Jahrhundert. 1892, et seq.

Up to the present 11 vols. have appeared, of which 5 treat of the Organisation of the Boards and of general Government Administration, 2 of the policy of the grain trade, 1 of minting-concerns, 3 of the Prussian silk-industry.

Das Tierreich. Eine Zusammenstellung und Kennzeichnung der rezenten Tierformen. 1896, et seq.

Up to the present 19 parts.

Prosopographia imperii Romani saec. I. II. III. Pars 1—3. 1897—98.

One part is still unpublished.

Die griechischen christlichen Schriftsteller der ersten drei Jahrhunderte. 1897, et seq.

The complete work is to appear in 50 vols., of which the 8 vols. already published are here exhibited.

Griechische Münzwerke. Since 1899.

It is intended to publish a work on the coins of N. Greece, the Grecian islands and Asia Minor. Only the 1st half of the 1st vol. of the antique coins of N. Greece has so far appeared.

Das Pflanzenreich. Regni vegetabilis conspectus. 1900 et seq.

Up to the present 18 numbers.

Kant's gesammelte Schriften. 1900 et seq.

It is intended to publish 22—25 vols. in 4 parts: Works, Correspondence, Writings left unpublished at death, Lectures. Up to the present 2 vols. of Works and 3 vols. of Correspondence have been published.

Wilhelm von Humboldts Gesammelte Schriften. 1903 et seq.

It is intended to publish 15—18 vols. in 3 parts: Works, Political Writings, Letters. So far 1 vol. of works and 2 vols. of Political Writings have appeared.

Monumenta Germaniae historica inde ab anno Christi 500 usque ad annum 1500.

Appearing since 1826; since 1875 under a central committee of direction, which is in close connection with the academy. So far 91 vols. have appeared which are divided into separate groups as follows:

Folio volumes:
- Leges. 5 vols.
- Scriptores. 31 vols.

Quarto volumes:
- Auctores antiquissimi. 11 vols.
- Deutsche Chroniken. 6 vols.
- Diplomata. 3 vols.

Epistolae. 6 vols.
Epistolae saeculi XIII. 3 vols.
Gesta pontificum Romanorum. 1 vol.
Leges. 9 vols. in 5 Sections.
Libelli de lite imperatorum et pontificum. 3 vols.
Libri confraternitatum. 1 vol.
Necrologia Germaniae. 2 vols.
Poetae latini. 4 vols.
Scriptores. 1 vol.
Scriptores rerum Langobardicarum et Italicarum. 1 vol.
Scriptores rerum Merovingicarum. 4 vols.
Indices. 1 vol.

A. Harnack, Geschichte der Königlich Preußischen Akademie der Wissenschaften zu Berlin. (History of the Royal Prussian Academy of Sciences in Berlin) Vol. 1—3 1900.

Die Zweihundertjahrfeier der Königlich Preußischen Akademie der Wissenschaften am 19. u. 20. März 1900. (The bi-centenary jubilee of the Academy of Sciences on the 19 and 20 March 1900.) Berlin 1900.

C. Royal Society of Sciences, Göttingen.

Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen.

The series has been appearing since 1751, at first in Latin under the title of Commentarii, later as Commentationes, and since 1838 in German with the title Abhandlungen. Exhibited are vols. 15—18 and 20—40, 1870 et seq, as well as the New Series beginning with 1896.

Göttingische gelehrte Anzeigen.

Appearing since 1739; since 1753 under direction of the Association of Sciences. Exhibited are the annual vols. 1870—1903.

Nachrichten von der Königlichen Gesellschaft der Wissenschaften zu Göttingen.

Appearing since 1845. Exhibited are the annual vols. 1870—1902.

C. F. Gauß, Werke. Vols. 1—6, 8, 9. 1863—1903.

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Festschrift zur Feier des hundertfünfzigjährigen Bestehens der Königlichen Gesellschaft der Wissenschaften zu Göttingen. 1901.

Proceedings of the physico-mathematical class. Proceedings of the philologics-historical class. Contributions to the biography and history of the Göttingen savants.

D. Royal Saxon Society of Sciences, Leipzig.

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Berichte über die Verhandlungen der Königlich Sächsischen Gesellschaft der Wissenschaften. Vols. 1. 2. 1846—1848. Physico-mathematical class. Vols. 1—54. 1849—1902. Philologico-historical class. Vols. 1—54. 1849—1902.

A. F. Möbius, Gesammelte Werke. Vols. 1—4. 1885—1887.

H. Grassmann, Gesammelte mathematische und physikalische Werke. Vols. 1, 2, 2. 1894—1902.

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J. Vogel, Anton Graff. 1898.

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Abhandlungen historischen und philosophischen Inhalts. Vols. 1—10. 1763—76.

Neue philosophische Abhandlungen. Vols. 1—7. 1778—97.

Neue historische Abhandlungen. Vols. 1—5. 1779—98.

Abhandlungen über Gegenstände der schönen Wissenschaften. Vols. 1. 1781.

Physikalische Abhandlungen. Parts. 1. 2. 1803, 06.

Neue historische Abhandlungen. Vols. 1. 2. 1804.

Historische Abhandlungen. Vols. 1—5. 1807—23.

Denkschriften. Vols. 1—9. 1808—24.

Abhandlungen der mathematisch-physikalischen Klasse. Vols. 1—21. 1832—1902.

Abhandlungen der philosophisch-philologischen Klasse. Vols. 1—21. 1835—1901.

Abhandlungen der historischen Klasse. Vols. 1—22. 1833—1902.

Jahres-Berichte. 1807—33.

Bulletin. 1842—53.

Sitzungsberichte. 1860—70.

Sitzungsberichte der mathematisch-physikalischen Klasse. Vols. 1—32. 1871—1902.

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Gelehrte Anzeigen. Vols. 1—50. 1835—60.

Münchener historisches Jahrbuch. 1865. 66.

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Astronomisch-geodätische Arbeiten. Parts 1—5. 1894 bis 1903.

Astronomische Beobachtungen (Observationes Astronomicae). 1819—44.

Annalen der Königlichen Sternwarte. Vols. 1—21. 1848 bis 1877. Supplementary Vols 1—14. 1851—84.

Neue Annalen der Königlichen Sternwarte. Vols. 1—3. 1890—98.

Meteorologische und magnetische Beobachtungen der Königlichen Sternwarte. Parts 1—7. 1876—82.

Historische Kommission bei der Königlich Bayerischen Akademie der Wissenschaften.

Quellen und Erörterungen zur bayerischen und deutschen Geschichte. Vols. 1—9. 1856—64. New Series. Vol. 1. 1903.

Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert. Since 1862. Up to the present 28 Vols.

Forschungen zur deutschen Geschichte. Vols. 1—26 and Register. 1862—86.

Jahrbücher der Deutschen Geschichte. Since 1862. Up to the present 26 Vols.

Geschichte der Wissenschaften in Deutschland. Neuere Zeit. Since 1864. Up to the present 30 Vols.

Deutsche Reichstagsakten. Since 1867. Up to the present 14 Vols.

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Abusir — Miletus and Priene

Large Photographs of Notable Buildings

Excavations have always played a very important rôle in the study of the history of the nations and ages of the past. In the laborious but extremely successful work of last century, and in the attempts to reveal by means of, the pick-axe and the shovel, the conditions of long-forgotten ages of which tradition affords us but scanty information, Germany rendered services by no means insignificant. In the exhibit devoted to the German excavations only those operations which are at present proceeding are represented, and, except in the case of the model of the reconstructed Saalburg, near Homburg v. d. H., each field of operation is represented by but a single reproduction. Thus there will be found specimens from the excavations of the German Oriental Society (Orient-Gesellschaft) in Babylon and Abusir, and the excavations in Miletus and Priene inaugurated by the Königlich Preussische Museumsverwaltung.

The managers of these operations have given short reports of the results in the appended pages.

In connection with the excavations there is a collection of large photographs from the Königliche Messbildanstalt, Berlin (Geh. Baurat Prof. Dr. Meydenbauer) representing older monumental buildings, especially of Western Germany, in a manner calculated to facilitate photogrammetric measurements, and which will prove very useful in Art-teaching in the German Schools.

1.

The Roman Citadel of Saalburg.

The Citadel of Saalburg belongs to a system of fortifications large and small which, after the subjection of the Rhine and Danube countries, the Romans put up along their frontier for the safety of the kingdom and to protect trade and commerce against the German tribes. This frontier, the *limes imperii romani,* extended from the Rhine to the Danube, a distance of 550 kilometers, through the whole of Middle Germany, and parts are still known as Pfahlgraben and as Teufelsmauer. About eighty larger citadels and 900 watch-towers, in the shape of the reconstructed model, have been recognised up to the present. One of the larger frontier fortifications, the Saalburg, 7 kilometers north of the present Homburg v. d. H., barred the most important pass in the Eastern Taunus Ranges, over which, from the earliest times, traffic between the lowlands of the Main and Lahn had been carried on uninterruptedly, and is indeed still carried on to-day. Here the second cohort of the Rhaetians, Germanic auxiliary-troops from the Danube country, held a strongly fortified outpost position for two centuries, whose rear connections joined in the ancient Moguntiacum (Mainz), the headquarters of the 22nd legion. Connection within the fertile lowlands of the Nidda and the Main, which enjoyed seasons of the greatest prosperity during the whole time of the Roman occupation, was effected by a highly developed net of made roads.

These Roman military buildings have long excited the attention of antiquaries, and all the more so because they were at the same time strongholds of colonisation from which the Roman civilisation was spread to the other parts of Germany, and further because, owing to the mixture of Roman and Germanic elements there, so many remnants of German culture have been transmitted to us by them. Scientific researches, however, were not undertaken until the beginning of last century, and only since the seventies has there been any systematic investigation and preservation of Saalburg. The State and private persons shared the cost. Of such significance were the results of the investigations in the Taunus citadel that when, in 1897, a place was being sought for the reception of the antiquities unearthed along the whole *limes,* Saalburg, comparatively the best preserved, was considered most suitable for the purpose. The valuable treasures obtained from Saalburg already filled a whole museum in Homburg. Moreover an attempt was to be made to re-build, as an instructive example, one of the numerous citadels on the basis of the knowledge hitherto acquired of Roman military architecture. The reconstruction has been carried out at the order of His Majesty the Emperor and King according to the designs of the director of the excavations, Geh. Baurat Jacobi of Homburg v. d. Höhe. The funds for the main building, the so-called Praetorium, and for the Porta Decumana have been granted by the Prussian State Treasury. Thanks to private contributions the walls surrounding the citadel, with their gates, are being gradually built up and the excavations proceeded with. The Praetorium and the greater part of the enclosing walls and three gates have now been completed, and the exhibited model of the Citadel (1:200) of the Praetorium and the reconstructed Porta Sinistra (1:50) show the work which has been accomplished up to the present.

The Citadel, situated about 220 meters behind the *limes,* on the site of the remains of two older buildings, corresponds, in its arrangement to the scheme of Roman military camps. Its ground-plan forms a rectangle (with rounded corners) of 221.45×147.18 meters (150×100 Roman passus). Around the crenellated outer-wall, 4.90 meters high, run two dry moats. Of the four gates the double Porta Decumana is the largest. It bears the inscription written by Mommsen:

GVILELMVS · II · FRIDERICI · III · FILIVS · GVILELMI · MAGNI · NEPOS
ANNO · REGNI · XV · IN · MEMORIAM · ET · HONOREM · PARENTVM
CASTELLVM · LIMITIS · ROMANI · SAALABVRGENSE . RESTITVIT.

In front of the middle column the Emperor has caused a bronze statue of the Emperor Antoninus Pius to be set up in place of a sand-stone original. On the pedestal is the following inscription:

IMPERATORI
ROMANORVM
TITO · AELIO · HADRIANO
ANTONINO
AVGVSTO PIO
GVILELMVS · II
IMPERATOR
GERMANORVM

Opposite this gate in the direction of the length of the rectangle is the *Porta Praetoria,* in the back third, in a direction at right angles to the former, are the *Porta Principalis Sinistra* the *Porta Principalis Dextra*. On the connecting road (*Via Principalis*) between these two side sally-ports, is the main-building of the encampment, the so-called Praetorium, built so that its "training-hall" lies over the street itself. Adjoining it are the armoury (*Armamentarium*) on the right, and on the left four apartments for equipment, on the two sides of a square court round which is a cloister-like walk. Around a second court, which contained statues of emperors and votive stones of the garrison, are grouped: the shrine of the standards with the military-chest and the pictures of the emperors, two adjacent halls at the sides, and two bureaus with heating apparatus, on the right of them an apartment for the archives (*Tabularium*) and on the left another, presumably for the guard (*Excubitorium*). In the court itself bronze statues of the Emperors Hadrian and Severus Alexander were set up on the spot where some antique remains were discovered, the funds being drawn from the Kultusministerium Treasury. The Citadel contains other large buildings the corn-magazine (*Horreum*) and a building either for administration or a military college in the rear camp. The space remaining free was subdivided with great exactness into spaces for the tents and huts of the soldiers, who later, when permitted to marry, settled outside the camp with wife and child. The military baths were in the front part of the camp. The commandant resided without' in a large richly-furnished official building, directly in front of the *Porta Decumana*. The bathing and heating arrangements of this building are still in a state of preservation. Near it there was probably a sentinel station with apartments that could he heated if desired and a large court-yard.

On the South in front of the *Porta Decumana,* on both sides of the paved main thoroughfare, is a row of stone-walled cellars, such as those by which one can always distinguish the houses of the Canabenses (camp-followers and inn-keepers) in front of the citadels. Not far behind them, near an abundant spring two oriental shrines were a short time since discovered, — that of Mater deum (*Cybele*), and that of the Persian sun-god Mithras, who was so much worshipped by the Roman army at the time of the Emperors. The latter shrine will be rebuilt in the course of the present year, also from funds provided by voluntary contributions.

Around the Citadel was spread the camp-village *(Vicus)* for the settlement consisting of soldiers, traders and veterans. This village covered an area of 45 hectars, but only to-day has a small portion, of it with some wooden houses and 57 wells been brought to light. This settlement was abandoned at about the beginning of the 3rd century, and only the Citadel, with the residence of the commandant, stood until the withdrawal of the Roman power. Then, between 260—270 A.D. the Romans were forced to yield the frontier and to withdraw again to the other side of the Rhine before the vehement onslaught of the allied Germanic tribes. What they left behind was certainly little more than ruins, but even these fragments suffice to give us an idea of the highly-developed state of their culture, and the remains of it, though often scanty, can sometimes give useful hints to us exacting moderns.

In the re-construction of these buildings all the methods of the Roman technique as it has been transmitted to us, not only in the remains of buildings preserved but also in the tools, etc. which have been discovered, have been reproduced as faithfully as possible. Masonry, mortar, etc., the lining of walls, floors and roofs, all have been carried out in the antique fashion, with the old materials or at least with materials taken from the old source of supply. The ancient water-supply and drainage system, with its pipes and wells, were again set in operation and especial care was bestowed upon the second important factor in the claims of hygiene, namely the complicated but most rational method of heating adopted by the Romans. To-day a Roman heating-apparatus *(Hypocaustum)* is working again in Saalburg, north of the Alps, for the first time for almost 1700 years.

Its construction may be seen in the model exhibited. In order to give a slight conception of the work of the Roman soldiers along the frontier, two groups of their implements, weapons and handicraft-tools have been placed on view in the cases. These two very different kinds of instruments were directed by one hand, for the Roman soldier was not only trained to conquer and to defend what he had taken, but he also understood the cultivation of the land he had acquired. These pioneer qualities were at the root of the Roman army's capacity for colonisation. Most of the weapons exhibited are models of lances and spears, two very valuable iron points of which and a particularly rare wooden shaft have not been found elsewhere than in the Saalburg. The tools are those of agricultural labourers, brick-layers, masons, stone-masons, carpenters and joiners, smiths and locksmiths who, with their cunningly fashioned locks, should perhaps be placed at the head of all. Scarcely any of the instruments vary at all from the modern ones — certainly not from those of the Middle Ages. Only lately have our tools undergone any considerable change owing to the importati onof American steel-instruments and labour-saving machinery. The fact, that they have been found in such numbers in Saalburg, inclines us to believe that extensive iron-smelting works were carried on in its vicinity, on Germanic methods.

These tools show us at once that the claims for comfort of the inhabitants of Saalburg were far more exacting than those of a primitive soldier-life, narrowed down by its exposed position on a military frontier. Other discoveries show us, too, that efforts were also made to render life in the province as comfortable and agreeable as possible by the importation of all the luxuries which formed a part of the life at home.

Thus the cases contain specimens of rich ornaments in bronze and silver, toilet articles, surgical instruments, writing-materials and lighting-materials, amongst which are some articles which in artistic finish are in no way behind those of the large cities. To these belong above all the models of 21 different types of shoes, which have, up to the present, been discovered only in Saalburg, owing to the preservative qualities of the water. There are wooden heelless slippers, sandals, lace shoes and closed boots, some being richly ornamented; they, together with numerous discoveries in wood, have been excavated from 66 wells. In careful execution and in taste, these are in no way to be distinguished from modern articles, and from them we may conclude that even then the Roman, although on the other side of the Alps, attached as much importance to a well-shod foot as does the modern Italian.

These specimens should suffice to give a picture of the life and doings in our German frontier citadels. They may also furnish a reason for the keen interest taken by scholars and laymen alike in the investigation of these monuments of Roman-Germanic provincial civilisation, and if the Prussian Education Department is right in its belief that it should supplement its work by the addition of a part of the Saalburg, this old Citadel, together with the Limes Museum, will, in the future, become more and more important as a practical object lesson in connection with classical studies in schools and colleges.

Authorities: L. Jacobi, Geh. Baurat. The Roman Citadel Saalburg, near Homburg v. d. H. 2 vols. Homburg v. d. H. 1897. Published by the author. Price 25 M., bound 30 M. This work will be found among the objects exhibited. A. v. Cohausen and L. Jacobi. The Roman citadel Saalburg. 7th Edition, with additions by H. Jacobi, Kgl. Landbauinspector. 1902. Price 1 M. — A. v. Cohausen, Oberst z. D. The Roman Frontier Wall in Germany. 2 vols. Wiesbaden. Published by Kreidel. 1884. Price 30 M. — Dr. E. Schulze. The Roman Frontier Buildings in Germany and the Limes Citadel of Saalburg. Gütersloh, C. Bertelsmann. 1903. Price 1.75 M. — The Upper Germanic-Raetic Limes of the Roman Empire. Publications of the Imperial Limes Commission. Heidelberg. Published by O. Petters. (In preparation.)*

A short summary in the English-Language is given in an essay entitled "Roman and Prehistoric Remains in Central Germany" by Edwin Swift Balch of Philadelphia in the "Journal of the Franklin Institute". Special copy published Homburg, 1904.

This pamphlet is placed at the disposal of those interested.

H. Jacobi, Homburg v. d. H.

I. Models.

1. Roman Citadel of Saalburg 1 : 200.
2. Praetorium, restored as a museum, 1 : 50.
3. Porta sinistra, 1 : 50.
4. Roman heating apparatus, hypocaustum, 1 : 20.
5. Tower on the Pfahlgraben.
6. Draw-wells, 1 : 10.
7. Model af a cart-wheel.

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* The above works are all in German.

II. Cases and wall-maps.

1. Back-wall.
   a) Middle: Plan of the site of the citadel and its surrounding.
   b) At the side: Copies of Roman arms with the models of a Roman legionary and a Frankish Warrior.
2. Left side-wall.
   a) Middle case: Agricultural implements, house utensils, glasses, candlesticks and lamps, tools for masons, bricklayers and stone-masons, medical instruments.
   b) Left and right: Photogrammetric pictures of the citadel and photographs of articles discovered.
3. Right side-wall.
   a) Middle case: Shoes and sandals, tools for shoe-makers and tanners, tools for carpenters and joiners, tools for smiths and lock-smiths, locks and parts of locks, door-plates, ornaments.
   b) Right and left: Photogrammetric pictures of the citadel and photographs of articles discovered.

Exhibitors: Royal Prussian Education Department, Geh. Baurat Jacobi, Homburg v. d. H. Master-joiners A. Schweitzer, R. Fritzel, G. Schlottner, C. Hochstätter, G. Düringer, Ph. Pfeiffer, J. Hofmann, F. Eckhardt; Master - wheelwright C. Strohmeyer; Master-locksmiths W. Merle, V. Jäger, W. Raab; Master-painters Karl and August Lepper, Louis Lepper; Master-glazier Fabre; Master-plumber F. Lotz, A. Ettlinger; Master-shoemakers M. Kofler, L. Eckhardt, J. Becker, E. Eckhardt, G. Ebert; L. Speitel, glass-ware; Fr. Sauer, ornaments; Bros. Lussmann, Frankfort a. M., bronze-ware; with the exception of the last-mentioned all are of Homburg v. d. H.

2.

Baalbek.

Nothing can convey a better idea of the world-wide power of the Roman Empire than the ruins of Heliopolis, the Baalbek of today. The two shrines built there in the time of the Antonines are the most eminent examples of the Asiatic-Roman style of architecture. They have been brought to light since the year 1901 at the command of H. M. the German

Emperor, under the direction of Professor Otto Puchstein by the architects B. Schulz, D. Kenker and H. Kohl.

The extent of the shrines is shown by two sections on a scale of 1 : 200. The larger of the two temples was the pilgrim-shrine of Jupiter Heliopolitanus, six columns of which are still standing. (See photo: No. 1.) A street, bordered with long colonnades, led up to the shrine. Then the way led through a magnificent propylaeum into a hexagonal pillared court, surrounded by *Exedrae* and halls (photo: No. 2). From here you passed through a triple-entrance into the altar-court (photo: 3). This courtyard measures in the clear 86:97½ meters. The examination proved that it also was surrounded by pillars, behind which lay the richly decorated *Exedrae* partly rectangular and partly semi-circular in shape (photo: No. 4). At the western end of the altar-court, seven meters above the level of its surroundings, rose the temple and at its foot the altar for burnt-offerings, on both sides of which lustration basins for the holy ablutions have been found.

The Jupiter temple was surrounded by Corinthian columns (10 at each end and 19 on each side) and had a double vestibule. The width of the temple was 45 meters, the height of its columns 20 meters and that of the stone slabs resting upon them 4 meters. In the sub-structure are free-stones of more than 20 meters in length and 3 meters in height, which have, from time immemorial, excited the wonder of visitors.

The second shrine lying south of the Jupiter temple is also in Corinthian style, most impressive in its size and richness of form. Photograph 5 shows the vestibule of the temple, sketch 6 gives a view of the capitals, and, under the richly ornamented ceiling of the outer colonnade sketch 7 shows the outer south wall, with the shaft of a pillar leaning against it. Along the façade of the temple stood 8 columns, and 15 along each of the two sides; probably the only reason why these have remained standing to the present day is that in the Middle Ages they were built into an Arabian fortress. In this temple especial admiration is always roused by the well-preserved door of the *Cella* (photo: No. 8) with its splendid framing. The walls of the *Cella* are composed of Corinthian half-pillars between which are exquisitely decorated niches (photo: No. 9). An open flight of steps led to the Holy of

Holies which, according to Semitic customs, might only be entered by the priests of the god himself.

The small circular temple (photo: No. 10) is a brilliant and very original representative of the picturesque baroque-style of the late Roman period. Its circle of columns widens out on the entrance-side to a vestibule led up to by an open flight of 21 steps. A stone cupola overarches the interior of the temple. Round the inner wall are tabernacular niches and outside circular niches between pilasters.

The photographs of Baalbek which are on exhibition were taken by the Messbild-Anstalt of the Royal Prussian Kultusministerium under the direction of Geh. Bau-Rat Meydenbauer. An accurate map of the site of the ruins will be made according to these photographs.

The most detailed information concerning the results of the Baalbek excavations is to be found in two reports by Prof. Puchstein and his colleagues in the year-book of the K. Deutsches Archäologisches Institut for 1901, beginning at p. 133 for 1902, at p. 87. A short summary of the results of recent research, with plans, is to be found in R. Borrmann's Geschichte der Baukunst (History of Architecture), vol. I, p. 291. (Leipzig E. A. Seemann 1904.)

The following **Large Photographs of Baalbek** (150 × 120 centimeters) are on view:

1. The six columns on the North side of the great temple.
2. View of the North side of the great entrance-court.
3. The altar court.
4. The Exedra near the North wall of the main court.
5. Vestibule of the small temple and Arabic tower.
6. Pillar capitals on the south side of the small temple.
7. South wall of the small temple.
8. Door of the Cella of the small temple.
9. Interior of the small temple towards the East.
10. Temple of Venus, East side;
    with it: a reproduction of the drawing of the South side,
    a reproduction of the drawing of the section,
    two pictures.

Dr. Wiegand.

3.

Babylon.

Since March 1899 excavation-works, at the instance of the **Deutsche Orient-Gesellschaft** (German Orient Association) in co-operation with the **General Administration of the Royal Museums**, have been in progress on the site of ancient **Babylon** for the purpose of making most thorough topographical and archaeological researches among the ruins of this great metropolis of ancient Western Asia. Although the excavations have extended to the actual site of the town, and have already led to the discovery of many a point important in fixing the exact boundaries of the ancient town — especially valuable in this connection are the positive identification of the hill of ruins **Amran-ibn-Ali**, with the Babylonic national shrine **Esagila**, and the determination of the course of the procession-street of **Marduk** between Esagila and the palace-town, — nevertheless the main work of investigation concentrated itself upon the mighty hill of ruins, called **Kasr** or the "Castle", situated hard by the little modern village **Kuwairisch**. It is the site of the Chaldaic royal palaces. In the southern part of this mountain-like hill Dr. **Koldewey**, the director of the expedition, discovered and excavated to a considerable extent the older palace of Nebuchadnezzar which was a reconstruction of the palace of his father, Nabopolassar; this palace was to a considerable extent excavated by Dr. **Koldewey**. But in the northern part that massive platform of tilefragments, which Nebuchadnezzar calls in his building-reports *pitiq agurri*, was laid bare and thereby the palace erected on this platform is irrefutably proved to have been the second palace of Nebuchadnezzar. Moreover it was proved that the procession-street of the god **Marduk**, paved with square blocks of limestone and red and white veined brescia, ran along the East front of those two palaces, the so-called "South fortress" and "North fortress", and that, on the East front of the North fortress, where, near the inner East wall, another parallel outer wall protected the castle, it was adorned between these two walls with especial pomp and magnificence. A lion-frieze of unique art and splendour of colour ran along on both sides of that part of the street. The friezes consisted of brightly coloured tile-reliefs, representing mighty lions striding forward with right royal tread, standing out against a blue back-ground and adorned with stripes and rosettes, sometimes with a white skin and yellow mane, and sometimes (but more rarely) with a yellow skin and green mane. The lions striding towards the left were on the West side of the outer, those going towards the right on the East side of the inner East wall.

At the South end of this imposing thoroughfare through which the Procession was wont to pass from North to South, that is between the East fronts of the North and South fortresses, was the double gate, dedicated to the goddes Istar. Its numerous walls, as they left the hands of Nebuchadnezzar's artists, were richly adorned with just the same kind of brightly glazed tilereliefs, only that these reliefs on the Istar gate represented steers and so-called "dragons" (Babyl. *ṣir-rusch*). With neck out stretched and threatening glance the monster — for convenience' sake entitled "dragon" — strides on: it is a serpent, as the double-tongued head, long, scaly body and winding tail show, but it has at the same time the fore-legs of the panther and its hind-legs are armed with giant bird-claws; it has also long straight horns on its head and a scorpion sting at the end of its tail. The steers and dragons are carried out in the same two colour-combinations as the lions — white and yellow, yellow and green.

All these representations of lions have, unfortunately, only been preserved in fragments of tiles — these, of course, in very great numbers — yet Dr. Koldewey and W. Andrae have managed, by means of the most careful observations, to reconstruct the original pictures. For the coloured representations of these rcconstructions of theirs we are indebted to the Regierungsbauführer Andrae, a member of the expedition. We may hope that a greater number of the original reliefs may be recovered from the tile-fragments, which, for this purpose, must be carefully freed from all salts adhering to them.

Within the "South fortress" a great court has been laid open, whose South side (most probably contiguous to Nebuchadnezzar's throne-room) was adorned with architecture of the richest description. A great number of glazed tiles were found there, showing those large ornaments made up of capitals, blossoms and vines, which Andrae has reconstructed from the fragments, and drawn in the original size and colours. He was greatly assisted by the circumstance that a not inconsiderable piece of the row of ornaments was found, which, although it had fallen, was lying in its original connection. The ornaments are not in relief but are carried out in the same enamel technique as the relief-tiles. Six colours have been used in the ornaments, viz. deep dark-blue, bright-blue, yellow, white, green and black.

Exhibited are:

Five copies of Babylonian flag-stone pictures, viz.:

1. Lion, striding towards the left, with white skin and yellow mane: enamelled tile-relief from the procession-street of the god Marduk in Babylon.
2. Lion, striding towards the right, with yellow skin and green mane: enamelled tile-relief from the procession-street of the god Marduk in Babylon.
3. "Dragon", striding towards the left, in yellow and green: enamelled tile-relief from the Istar Gate in Babylon.
4. "Dragon", striding towards the right, in white and yellow: enamelled tile-relief from the Istar Gate in Babylon.
5. Ornament on glazed tiles from the South fortress of the Kasr (Babylon).

All the copies of the original paintings by W. Andrae, Dresden, member of the German Babylonian Expedition.

Delitzsch.

4.

The Excavations of the Deutsche Orient-Gesellschaft at Abusir.

The first great epoch of Egyptian History, the so-called "ancient empire", was till quite recently known to us, one might say, only through its graves, the giant-pyramids of its kings and the numerous tombs of distinguished men which lie around the royal sepulchres in the burial-grounds of Gizeh, Abusir and Sakkara. They are full of pictures and inscriptions, but since these pictures and inscriptions are almost all of the same kind, our knowledge of the ancient kingdom remained necessarily rather one-sided as long as we had these alone to refer to. And in the same way our knowledge of the architecture of this great epoch was inadequate and we were unable to tell whether this age, whose technical power we admire and wonder at in the pyramids, had also cultivated the artistic side of architecture. It was therefore for the sake of science greatly to be desired that to all the graves of the ancient empire which were yearly discovered, a ruin of another kind might some day be added; certainly there seemed to be very little chance of this, for the ancient temples had obviously almost all been replaced by new buildings of later centuries.

Then some Arabs, who, six years ago, were digging in the burial-grounds of Abusir near Memphis, found some fragments which were sent to the Berlin Museum where they were recognised as remnants of temple-reliefs; this clue was followed up further, and it turned out that, in Abu Gurab, an immense rubbish heap, always looked upon as the most northerly hill of Abusir, a temple was hidden away which had been built by king Ne-woser-re to the Sun-god, about 2500 B.C. Thanks to the generosity of Dr. von Bissing, this ruin was thoroughly explored by Dr. Borchardt in 1898—1901, and although it was in such a state of decay, we yet obtained from it a glimpse into a temple of the ancient empire and show for the first time sculptures of this epoch which had not been made for graves. But at the same time it was shown that chance had, in this temple, brought to our knowledge a shrine of an irregular and exceptional kind. Abu Gurab was a place of worship for a most unusual religious cult, whose ceremonies were performed in the open air, a giant obelisk serving as throne for the god. It therefore seemed desirable to find still another temple of ancient times which could show us the nature of the buildings which served as models for the colossal temples of later Egypt. An opportunity to examine such a building, presented itself in the immediate vicinity of the former excavations. In the actual burial-field of Abusir, in front of the pyramid of the same king, Ne-woser-re, who had built the sun emple, the remains of the temple which had once served for the worship of this ruler were discovered. Thanks to the generosity of one of its members, the Deutsche Orient-Gesellschaft was once more able to take the matter in hand; it again put the management into the hands of Dr. Borchardt, and after three years' excavation (1901—1904) a result has been attained which has in many ways furthered the aims of science.

The temple whose remains are here exposed to view, shows us on the whole the same design as is seen in the alter temples; like them it possesses even at this early date the most beautiful part of the Egyptian sanctuary, the pillared court for the great festivals and sacrifices. And these pillars already possess the beautiful form which we see later, the water-spouts of the roof are already made in the form of lions; the architraves even then bore the inscription of consecration, and all that has been preserved of the decorative parts of the building shows that it was constructed on exactly the same lines as the later temples. Anyone who examined the great relief, which shows the king standing before a goddess, would, if the name of the ancient ruler were not inscribed upon it, be inclined to classify this relief as belonging to a far later age, and one would form the same opinion in the case of the fragment which represents the king as a sphinx, striding over a slain barbarian. Both figures and style are similar to those we meet with in the later temples and in this very fact lies the chief result of the excavations. We are shown that the official art of ancient Egypt as applied in the temples was permanently formed at a much earlier date than we could ever have supposed: when the temple of Abusir was built, it was already definitely formed in all essential features, in architecture as well as in sculpture. Its style remained unaltered at the time of the ancient empire, and the alterations made by later ages were but few.

As in every great work of excavation, we found all kinds of things which we were not in search of, but which were therefore all the more welcome: graves from the time of the king and that remarkable triple-grave of three princesses, graves of the middle empire (2000 B.C.) with all the accessories that were at that time laid in with the coffins, and finally numbers of graves of the latest Egyptian times. And near one of these last lay loose in the sand a treasure which of itself would almost have made the excavation worth while —this was the roll of papyrus containing the "Nomos" of

Timotheus. Who would have thought that here, among ruins of the third millennium before Christ, a poem on the battle of Salamis, a famous lost work of Grecian poetry, was awaiting us?

Dr. Borchardt.

Exhibited are:

Excavations of the Deutsche Orient-Gesellschaft in Abusir, 1901/1904.

1. Ground-plan.
2. Model of the whole field of the pyramids, water-colour.

5.

Miletus and Priene.

Since 1899 excavations on a very large scale have been proceeding in the environs of ancient Miletus at the instance of the Royal Prussian Administration of Museums. Dr. Th. Wiegand, Direktor of the Administration, is superintending the work. Miletus is situated at the mouth of the Meander, opposite Samos. Its great historical and archaeological interest as the most important centre of ancient Greek colonial policy and as one of the most important points of the commerce of the Ancient World, has long been recognised. The town dates back to the 8th century B.C., and its importance reaches right down to Christian times. The excavations, which are made very difficult by the alluvia of the Meander, could at last be commenced owing to a generous contribution from H. M. the German Emperor. The wcrk is still proceeding and will presumably continue for several years, since it is intended to make the town and the surrounding districts the object of careful and comprehensive research.

The researches which have been made up to the present have enabled us to determine the course of the city-walls, the site of the Sacred Gate which led to the largest temple in Asia Minor, the Apollo shrine of Didyma, and the position of the Necropolis, which ran parallel to the Sacred Procession-way. Photograph No. 1, from a reconstruction sketch by the architect Dr. J. Hülsen, represents one of the most illustrious Doric burial-temples of about 200 B.C.

Within the town the first thing discovered was the system of the streets, crossing one another at right-angles, then the position of the principal harbour, of the market-places, of the Senate House, the Baths, the Stadium and of the brillant Nymphaeum erected by the Emperor Titus. Lastly the theatre was brought to light, a gigantic building dating from the time of the Emperor Trajan, over 500 meters in circumference, from which 10,000 cubic meters of rubbish had to be removed. The remains of the auditorium and stage are now once more visible. Photo. No. 2 gives a view of the façade of the theatre, 140 meters wide; drawing 3 shows the substructions with the north-west "parodos" wall of the theatre; Photo. 4 shows a well preserved portal of the same wing. Photo. 5 represents the construction of the vaulted passage-ways within the auditorium, by way of which the public entered the separate rows of seats. Photo. 6 gives a view from the top of the theatre down into the auditorium, before it had been cleared out. Photo. 7 shows the progress made in the excavation a month later, the marble-seats being already exposed to view. Photo. 8 represents a scene during the visit of the Crown Prince of Germany to Miletus, from the site of the ancient Imperial box. He is watching the wrestling-matches got up by the population in his honour.

Of especial importance is the excavation of the Senate House, built 200 B.C., for its remains have been preserved in such abundance that Regierungsbaumeister Hubert Knackfus was able to faithfully reconstruct the entire building down to the smallest details. This reconstruction presents for the first time a reliable picture of an ancient Senate House one that we can depend upon even to the details of the uppermost parts. Plan 9 shows, on the space below, the ground plan of the Propylaeum leading into a rectangular, pillared court. It is supported by magnificent Corinthian columes and adorned with a frieze of weapons. In the centre of the court stood the altar, 9 meters long, covered with mythological reliefs; behind it was the assembly-building itself in Doric decorative architecture, its semi-circular marble seats furnishing room for 500 senators. Plan 10 shows the Senate Room in its present state of preservation; plan 11 represents an enormonus marble tripod found in the Senate House; plan 12 gives a view in perspective of the whole Senate House.

The map of Priene exhibited shows, on a scale of 1:1000, the results of the excavations of this Grecian inland town (which lies at the foot of the Mykale Range, 15 kilometers N. of Miletus) which took place at the instance of the Royal Prussian Administration of Museums under the direction of Th. Wiegand. The importance of these excavations lies in the fact that by means of them one obtains a grand, lucid and comprehensive picture of the civilisation of Grecian towns at the time of the Macedonian Empire. Priene has justly been called a Grecian Pompeii. The most detailed information concerning the strikingly regular arrangement of the city, its market-place and the famous temple to Athena, consecrated by Alexander the Great, concerning the excellently preserved theatre and the gymnasia, above all enlightenment on the momentous question of how the ancient Greeks lived and how they decorated their own homes, is given in the 1st vol. of "Priene", a work by Th. Wiegand and H. Schrader (Berlin 1904).

Dr. Wiegand.

On exhibition are:

1) 12 photographs of Miletus, reproduced in the Royal Messbild-Anstalt, Berlin.
2) Map of Priene.

Large Photographs of Notable Edifices.

By the Kgl. Messbildanstalt, Berlin.

Geh. Baurat Prof. Dr. M. Meydenbauer.

Aachen Cathedral.
"Liebfrauenkirche" in Andernach.
Bonn Cathedral.
Castle Bürresheim (in the Eifel).
Court of Castle Bürresheim.
Pfalz near Caub (on the Rhine).
Castle Cochem (on the Mosel).
The Cathedral of Cologne.
The Church of the Apostles in Cologne.
Town-hall in Cologne.
Town-hall in Dortmund.
Castle Eltz (on the Mosel).
Court of Castle Eltz.

Römerberg in Frankfurt a. M.
Ruin of the Cistercian church in Heisterbach (Siebengebirge).
Cathedral in Limburg (on the Lahn).
Marksburg (on the Rhine).
Cathedral in Minden, Interior.
Town-hall in Münster, in Westphalia.
Town-hall in Paderborn.
Porta nigra in Treves.
Cathedral and "Liebfrauenkirche" in Treves.
Church of St. Paulin in Treves.
Market-place in Treves.
Cathedral in Xanten, Exterior.

Universities

(Plans and Illustrations)

The German Empire contains 21 Universities, 10 of which are in Prussia: Berlin, founded in 1809, Bonn, founded in 1818, Breslau, founded originally in 1702 and refounded in 1811, Göttingen, founded 1737, Greifswald, founded 1456, Halle (combined with Wittenberg) founded 1694, Kiel, founded 1665, Königsberg, founded 1544, Marburg, founded 1527, and Münster, founded as an Academy in 1771 and as a University in 1902.

The Kingdom of Bavaria has three Universities: Munich (originally in Landshut) founded for a second time in 1829, Würzburg, founded in 1582, and Erlangen, founded in 1743

The University of the Kingdom of Saxony is in Leipsic, founded 1409; that of the Kingdom of Württemberg in Tübingen, founded 1477; in the Grand Duchy of Baden are the Universities of Heidelberg, founded 1386, and of Freiburg i. B., founded 1457; in the Grand Duchy of Hessen there is the Giessen University, founded 1607, in the Grand Duchy of Mecklenburg-Schwerin that of Rostock, founded 1419, in the Grand Duchy of Saxe-Weimar that of Jena (partly supported by the Saxon Duchies), founded 1558, and in the Imperial Provinces of Alsace and Lorraine the Strassburg University, founded in its present form in 1872.

As we have frequently asserted, it was out of the question that this exhibition should attempt to present a complete picture of the buildings and general fittings and appliances of all the German Universities. We were obliged, on the contrary, to limit the exhibits to things belonging to the last ten years and arousing a more than local interest. For this reason nine Prussian, one Bavarian and three Saxon Universities have been represented by ground-plans, drawings of appliances and fittings, views and large photographs which are partly collected in portfolios and partly hung upon the walls.

Institutions which are connected with the Universities, or which are under the Department of Education, have also been represented, such as the Royal Library in Berlin, the Meteorological Institute with the Aeronautical Observatory which is now in course of erection, the Königliche Messbildanstalt in Berlin and the Akademischer Ruderverein of Berlin.

1.

Map of the German Empire

with all the University towns marked.

2.

Plans and Photographs of University Buildings.

a) Berlin University.

Royal Charité-Hospital. Drawings of appliances and fittings of the new Buildings for the Management, of the Director's house, of the Clinic for Diseases of the Nose, Ear and Throat, of the Band, of the Kitchen, machine-house and work-shops, and of the Pathological Museum of the Charité, ground-plans of the New Pathological Institute now being erected, and of the Psychiatric and Nerve Clinic.

Bird's eye views and water-colour, painted by Prof. Theuerkauf of Charlottenburg.

General plan on a scale of 1 : 500 with the ground-plan of the more important buildings.

Revolving-stand with 72 photographs of the Charité.

Perspective picture of the new buildings of the Hygiene Institutes and of the 1st Chemical Institute. Drawings of appliances and fittings of the Institute for Infectious Diseases.

Oil-painting of the new Botanical Gardens in Dahlem, painted by Martini, Berlin.

b) Bonn University.

Large photograph of the main part of the University buildings.

Drawings of appliances and fittings of the Evangelical-theological Foundation, of the Farm-buildings in connection with the Clinical Establishments, of the Hydrotherapeutic department, of the Surgical Policlinic, and of the new Eye Clinic.

c) Breslau University.

Drawings of fittings and appliances of the new Anatomical Institute, of the Eye Clinic, of the Pharmacological Institute, of the Hygienic Institute, of the Physiological and of the Physical Institute, and finally of the Children's Clinic.

Plans of the Zoological Institute.

Large photographs of the Surgical Clinic, of the Medical Institute, of the University (Portal), of the Dissecting Rooms (side view, stair-case and front view), of the Eye Clinic, of the Botanical Gardens, of the Surgical Clinic (Loggias) of the Women's Clinic (general view and gable view), of the Clinic for Skin Diseases, of the Hygienic Institute, of the Children's Clinic, of the kitchen belonging to the Clinics, of the Pathological Institute, of the Physiological Institute, of the Management Buildings of the Clinics, and of the Zoological Institute. Photos by the Kgl. Messbildanstalt, Berlin.

d) Göttingen University.

Drawings of fittings and appliances of the new Women's Clinic and of the additions to the Anatomical Institute.

Drawings of the new Physical Institute.

Photographs of University Institutes, of the Dissecting Rooms, of the Women's Clinic, of the Museum for Natural History, of the Library, Great Lecture Room, Lecture-halls, Gymnasium, Fencing-room, Geophysical Institute, Chemical Laboratory, Surgical Clinic, Medical Clinic, Pathological Institute and Observatory.

e) Greifswald University.

Photographs of the University buildings and of the Lecture Hall of the University Women's Clinic.

f) Halle University.

Drawings of fittings and appliances and photographs of the Veterinary Institute and of the Lecture-halls and Seminary Buildings.

g) Kiel University.

Drawings of the additions to the Women's Clinic, made in 1898 and 1902.

Drawings and photographs of the new buildings of to the Meridian House with the Meteorological Observatory, of the new Surgical Clinic, of the new Physical Institute, of the additions to the Lecture Building, of the new Surgical Clinic and of the new University Clinic for the Insane.

h) Königsberg University.

Ground-plans and photographic view of the Palaestra Albertina.

Drawings of fittings and appliances of the new Royal University Library, of the alterations and additions to the Medical Clinic, of the new Greenhouse in the Botanical Gardens, of the new Hygienic Institute and of the University buildings and additions to the Pharmaceutical Chemical Laboratory.

i) Marburg University.

Large photographs giving a general view of the University with Reformed Church, of the Physiological Institute, of the Castle, of the Rittersaal, of the Castle seen from the tower of the Luther Church, of the University (main view from the bridge, near view from the street), and Promenade Hall of the University, view of the Anatomical Institute. Photos by the Kgl. Messbildanstalt, Berlin.

Drawings of fittings and appliances of the Surgical Clinic, of the Anatomical Institute and of the University Library.

Colored sketches of the Jansen frescoes in the Lecture-room of the University and sketch of the lecture-room window.

Royal Bavarian Julius Maximilian University, Würzburg.

General plan of the University, with special plans of the separate buildings,

Old University-building (exterior view), Central Building, Entrance Hall, Staircase, large Lecture Room, Dissecting Rooms (exterior view), Surgical Clinic (exterior view), Operation Hall, Psychiatrical Clinic, Physical Institute, Zoologico-zootomic Institute, Physiological Institute, Chemical Institute (exterior view), Chemical Institute, Lecture Room (Chemical Institute), Organic Laboratory, Eye Clinic (exterior view), Eye Clinic (Lecture Room).

Mineralogico-geologic Institute (exterior view), Hall for Collections, Lecture Room.

Pathological Dissecting Rooms (exterior view), Julius Hospital.

From the University Library.

S. Kiliani Evangeliarium Saec. VII.
Evangeliarium Saec. VIII.
S. Burkardi Evangeliarium Saec. VI. Front and Back Covers.
Evangeliarium Saec. XI.
Biblia latina Saec. V.
Evangeliarium Saec. VIII.

Books.

Wegele, Geschichte der Universität Würzburg.
v. Horstig, Die Anstalten der Universität Würzburg.
Dr. Nirschl, Die Universitätskirche.
Verzeichnis der Vorlesungen der Universität Würzburg von 1896 bis 1903/04.
Verzeichnis der Kunstsammlungen.
Wegele, Die Reformation der Universität Würzburg.
Risch, Zur Geschichte der Juristenfakultät an der Universität Würzburg.
v. Koelliker, Zur Geschichte der Medizinischen Fakultät an der Universität Würzburg.
Hofmeier, Die Entwicklung der deutschen geburtshilflichen Unterrichtsanstalten.
v. Schanz, Die neue Universität und die neue Mittelschule.
Meurer, Übersicht über die Arbeiten der Haager Friedenskonferenz.

Royal Saxon University of Leipzig.

Photographic and colored views of the Augusteum, the Pauliner Church, the large Promenade Hall and the Library, the Agricultural Institute, the Women's Clinic, the Physics Institute, the Chemical Institute, the Pathological Establishment and the Institute for Forensic Medicine, the Surgical Institute, the Veterinary Institute and the Clinic.

Sections of the ground-plans, exterior views and views of the interior of the main building of the University, of the

Pauliner Church and of the Library; also of the following Medical Institutes: the Anatomical Institute, the Pharmacological Institute, the Eye Clinic, the Physiological Institute, the Women's Clinic, the Surgical Clinic, the Medical Clinic, the Hygienic Institute, the Pathological Institute, the Psychiatric and Nerve Clinic; of the following Natural Science Institutes: the Chemical Laboratory, the Laboratory for Applied Chemistry, the Physicochemical Institute, the Physical Institute, the Mathematical Mineralogical and Palaeontological Institute, the Zoological Institute, the Observatory, the Agricultural Institute, the Botanic Institute, the Veterinary Institute and Clinic, and the Institute for Experimental Psychology.

A plan of the University Grounds.

3.

New Buildings

of the Royal Library, Royal Academy of Sciences and University Library, Berlin.

Architectural drawings after plans by Geh. Ober-Hofbaurat Ihne, Berlin.

General view, oil-painting by Grete Waldau, Berlin.

4.

The Meteorological Observatory

of the Royal Meteorological Institute on Telegraph Hill near Potsdam.

View in water-colours taken from the dome of the Astrophysical Observatory, by E. Palm, Berlin.

The Meteorological Institute is situated, together with the Magnetic Observatory, on Telegraph Hill near Potsdam in the vicinity of the Royal Astro-physical Observatory and the Royal Geodetic Institute.

5.

Large Photographs

of the Scientific Institutes on Telegraph Hill, near Potsdam.

(Exhibited in the department "Scientific Instruments".)

1. Entrance to the Institutes.
2. Astrophysical Observatory.

3. Observatory.
4. Observatory.
5. The large double refractor.
6. Small telescope.
7. Royal Geodetic Institute.
8. Hall in the Geodetic Institute.
9. Meteorological Observatory.
10. Magnetic Observatory.

Photographs by the Kgl. Messbildanstalt, Berlin.

6.

New Building

Aeronautical Observatory of the Royal Meteorological Institute near Lindenberg.

Water-color, by E. Palm, Berlin.

The Aeronautical Observatory of the Royal Meteorological Institute was erected in 1899 in the North of Berlin on the Tegel Rifle Ranges. Its function is to make researches in the upper strata of the atmosphere by means of kites and balloons. It is intended to transfer the Observatory in 1905 to a hilly district where there is very little traffic, situated 65 km. S. E. of Berlin, 120 m. above the level of the sea, in order to avoid the disadvantages and dangers arising from the close vicinity of a large city and its traffic system (especially the electric tramways). The new observatory will have three dwellings and offices attached to it, a machine-house and work-shops, a balloon-hall, a rotatory windlass-house and a gas-holder for hydrogen-gas, electric machines and gas generators.

The picture shows the kite-balloon, which has met with too much wind in an ascent just made, being brought back into the balloon-hall, whilst two kites from the rotatory windlass-house on the top of the hill are being sent up.

7.

Boat-house

of the Akademischer Ruderverein (University Rowing Club), Berlin.

Water-color, by Reinhold Hansche, representing the new boat-house at Grünau, taken from the Langer Sec

(Wendische Spree). The boat-house, which was erected in 1903, overlooks the Berlin Regatta Course. Emperor William II. contributed a considerable sum to its erection, and presented the Club with a picture of himself to be hung in the Recreation Hall.

In the lower story of the boat-house are the boat-rooms, dressing-rooms and shower-bath rooms, and a dwelling for the married care-taker with kitchen and serving-room. In the upper story are the Committee and Session rooms, bedrooms for members and a Recreation-Hall with the requisite side-rooms. The attic story has been utilised as much as possible for providing sleeping-rooms for the crews in training, and for separate rooms, drying-lofts etc.

8.

Statue of Athena Lemnia.

Imitated in antique bronze.

Restored by August Gerber, Kunstanstalt, Cologne, after Furtwängler and Aldenhoven.

9.

Busts.

Mommsen, modelled by Dr. Walter Lobach, Charlottenburg.

Gutenberg, Goethe, Luther, Kant, A. v. Humboldt,
W. v. Humboldt, Niebuhr, Schönlein, Winkelmann,
Schleiermacher, Liebig.

By August Gerber, Kunstanstalt, Cologne.

Technical Colleges

Germany, recognising that an extension of industrial activity was necessary to bring about an increase in her economic prosperity, decided upon the introduction of Technical Schools. These schools, acting on lines parallel to the practical undertakings of such men as Krupp, Siemens. Borsig and others, were meant to give a scientific basis to German industry. Starting from small beginnings — for they were at first established as Indermediate Schools — they did not attain the full dignity of Colleges until the second half of the 19th century.

The German Empire now possesses 11 Technical Colleges, 4 of which are in Prussia: one in Berlin, proceeding from the union in 1879 of the „Bauakademie“ founded in 1799 with the „Gewerbeakademie“ founded in 1821; one in Hannover founded in 1831, founded as a Technical College in 1879; one in Aachen, founded in 1870; and one in Danzig, founded in 1904. A fifth Technical College in Breslau is in course of preparation, and will be opened in 1905. In Bavaria the school founded in Munich in 1827 was established as a Technical College in 1877; Saxony possesses a similar school in Dresden, founded 1828, established as a Technical College in 1851; in Württemberg the school in Stuttgart, founded in 1829, was established as a Technical College in 1862; Baden has the school in Karlsruhe, founded in 1825, established as a Technical College in 1865; in Hessen a school was founded in Darmstadt in 1836, and established as a Technical College in 1868; finally the Duchy of Braunschweig has one of these institutions in Braunschweig, founded 1745, established as a Technical College in 1877.

The object of the Technical Colleges is defined as follows by the Statutes of the Constitution of the Berlin Technical College: "Such schools shall give advanced training for technical professions in Government and municipal service, as well as in industrial life, and shall cultivate the arts and sciences which belong to technical instruction." All the Technical Colleges are divided into separate departments: architecture, civil engineering, mechanical engineering, chemistry and metallurgy, natural sciences and mathematics. Besides these there are special departments for ship-building in Berlin and Danzig, for forestry in Karlsruhe, for agriculture in Munich and for pharmacy in Braunschweig.

The Exhibit of the Technical Colleges can reproduce only the form, not the substance, of the instruction imparted in such Colleges. The various photographs of work in the laboratories give only a faint idea of the busy life that continually fills these rooms. The results of the instruction cannot be estimated from drawings, but only from a knowledge of the work done by the students in after life on the basis of their theoretic training. What is here presented, therefore, must only be looked upon as the mere hull of this intellectual training.

In the centre of the exhibit of the Technical Colleges stands the "Dämon des Dampfes" (Demon of Steam) — a statue from the light-court of the Berlin Technical College, modelled by Prof. Reusch of Königsberg. Next comes a model of all the buildings of this College, on a scale of 1 : 100. The main building was erected in 1884 and was intended to accommodate 1500 students. In ten years' time the number of students had doubled, so that it became necessary to put up the additions on the West side of the piece of land. In the East is the building for the Department for Chemistry and Metallurgy. Adjoining this is the Mechanisch-technische Versuchsanstalt; this last having been transferred to another piece of ground, the buildings, which had now become free, were used for laboratory purposes. The South side of the Park is taken up by the Mechanical Laboratory, already twice enlarged, the boiler-house, and a hall erected for the reception of the whole of the Exhibit of the German Chemical Industry in Paris.

The pictures exhibited, which are partly arranged in a revolving-stand, give some idea of the arrangement of the lecture-halls, drawing-class-rooms and laboratories, and show at the same time that the architectural form and adornment of the great halls of the College were specially intended to hold up before the eyes of the students worthy examples of architectonic art.

Models taken from the collections — the ocean-liner Wilhelm II, a machine worked by electricity sent by the railway-department, models of driving-gear of various kinds — are intended to convey to the layman an approximate idea of the departments of knowledge represented at the Technical Colleges. A comparison of the small machine models of former times with the large demonstration machine for the cog-wheel theory will show what a revolution must have been made in the methods of demonstration in order to satisfy the needs of an audience of five-hundred students.

The Technical College in Dresden has had a large new building erected at a cost of four million Marks, which consists of mechanico-technical and electro-technical laboratories connected with Lecture-Halls for Experiments, and Drawing Class-rooms. A model of this important new building is shown as part of the exhibit.

A statistical diagram shows the relationship between the development of the Prussian State and its Technical Colleges in the 19th century. After the Napoleonic wars the population increased very slowly until about the middle of the century. The Technical Colleges then began to develop, the numbers attending them increasing with great rapidity. Then followed, beginning in the early sixties, a rapid increase in the production of raw iron in Prussia, accompanied by a quick rise in the number of inhabitants. Notwithstanding this increase in the population, however, from the year 1885 the number of emigrants began to diminish, the continual expansion of the raw-iron industry bringing the people work and money in plenty in their own country, and thus rendering it unnecessary to seek prosperity abroad.

Kammerer, Berlin.

1.

Diagrams showing the Attendance at the German Technical Colleges.

By Prof. Dyck of Munich.

2.

Technische Hochschule, Berlin-Charlottenburg.

Graphic statistics of the Technical Colleges of Prussia.
Statue, "Dämon des Dampfes" (Demon of steam).
Model of the Technical College.
Model of the Ocean-liner "Emperor William II."
Model of a revolving stage worked by electricity.
Demonstrating machine for the cog-wheel theory.
Photograms of the Technical College.
30 photographs from the Charlottenburg Technical College, in revolving stand.

3.

Technische Hochschule, Aachen.

Graphic statistics.

4.

Technische Hochschule, Danzig.

Water-color, by E. Palm, Berlin.

5.

Königlich sächsische Technische Hochschule, Dresden.

Model and plans of the new-buildings erected in 1898 to 1904 for the Mechanical Department.

A. Machine laboratories (steam-machines, gas-motors, freezing machines, etc.).

B. Main building for machine engineers (Lecture and Construction Halls, Technological Collection).

C. Mechanisch-technische Versuchsanstalt (theory of solids, testing of substances, machine work-shop).

D. Elektrotechnisches Institut.

E. Central works for the heating and lighting of the new buildings.

As shown in the plans, all the new buildings are capable of enlargement.

6.

Kgl. sächsische Bergakademie zu Freiberg i. S.

Pamphlet with the title:

Die Königlich sächsische Bergakademie zu Freiberg und die Königlich geologische Landesanstalt, nebst Mitteilungen über die Entwicklung und den Stand des Berg- und Hüttenwesens und der Bergpolizei im Königreich Sachsen. Herausgegeben von der Königlichen Bergakademie.

Contents:

1. History, present organisation and statistics of the Freiburg School of Mines. With text illustrations. By Oberbergrat Prof. Dr. Papperitz.
2. The Scientific Importance of the School of Mines in the 18th and 19th centuries. Speech given at the close of the 137th working-year, 25th July 1903. With text illustrations.
3. The Kgl. geologische Landesanstalt. By Geh. Bergrat Prof. Dr. Credner.
4. Development and present state of Mining in the Kingdom of Saxony. By Oberbergrat Prof. Treptow.
5. Development and present state of Metallurgy in the Kingdom of Saxony.
6. Development and present state of the Mine Police System in the Kingdom of Saxony. By Bergamtsrat Prof. Dr. Kong.

7.

Städtische Handelsschule, (Municipal Commercial Academy), Cologne.

Photographs of the Commercial Academy.

Representation of the development of the Academy from 1901-1904.

Plans of the new Commercial Academy recently started.

Memorial Publication: "Die Städtische Handels-Hochschule in Köln, die erste selbständige Handels-Hochschule in Deutschland".

A Publication: "Vorlesungsverzeichnis für das Wintersemester 1903—04."

A Publication: "Amtliches Personalverzeichnis für das Wintersemester 1903—04."

8.

Busts.

Portrait busts of Gauss, Helmholtz, Siemens.
By August Gerber, Cologne.

The Lecture Hall

is intended to represent a small-sized auditorium such as is generally to be found in the German Universities and Colleges, fitted up with all the appliances and apparatus for use in instruction and in making experiments. It is, however, also intended to serve as a hall in which lectures may be given and demonstrations and experiments of different kinds may be made not only in connection with the various branches of the Educational Exhibit, but also for all departments of the whole German Exhibit.

The expenses involved in making the architectural arrangements of the Lecture hall suitable to these requirements have been paid by the German Government.

The following objects are exhibited in the Hall.

Max Kohl, Chemnitz.

Contrivances for darkening the Lecture Hall, viz.

Contrivance for shutting off the light from above, including iron fittings.

Electric apparatus for working the same.

Experimenting table.

Teak frame for black-boards.

Hook on the ceiling with pulley and screw block and pulley.

Projection diaphragm with electro-motor appliances, with contrivance for raising maps, etc.

Experimenting switch sboard.

Water air-pump and bellows on shelf.

Prof. Dr. Miethe, Charlottenburg.

Projection apparatus for natural-color photography with instruments pertaining to the same and series of pictures.

Carl Zeiss, optische Werkstätte, Jena.

Epidiascopic apparatus.

P. Joh. Müller & Co., Berlin.

Lecture Hall subsellia (Albis model) with folding seats, iron side-parts and desks belonging to the same.

Exhibits of the Scientific Departments

I. Chemistry

II. Scientific Instruments

III. Medicine

(see the separate catalogues)

IV. Zoology and Botany

Zoological Department.

The zoological department of the German Educational Exhibition is meant to show the means and methods used in the German zoological museums to teach the great mass of the nation and especially the students of the higher educational institutions the diversity and quantity of organisms, their organisation and different ways of living and their position in the economy of nature and man. This exhibition has an entirely zoological character, as plants are not so fit for a museum-show as animals and are better demonstrated in botanical gardens. The German Museums besides cultivating the systematic knowledge of animals devote much care to the demonstration of anatomical and embryological preparations, as anatomy and embryology form the absolutely necessary foundation for a deeper biological understanding. The exhibition shows to some extent the diversity and the technical differences of such preparations, although it must not be forgotten that many of the very best objects of our museums could not be sent to St. Louis for danger of damage. Except a few specimens of the German Deep-sea Expedition of 1898/99 no rare objects are shown in this department, but only such as are especially instructive and have a certain pedagogical value by their manner of being mounted, preserved, prepared or explained. As microscopical or very complicated organisms and organs are best shown in the form of magnified models, two of our best firms have exhibited some of their preparations. Special care has been taken in demonstrating „biological“ groups, i. e. to show the organisms in their natural surroundings so that one can easily see in what way they are adapted to their conditions of life. Some lithographic plates have been arranged on the walls of this department and the visitor will see that the art of illustrating biological books and memoirs has reached a remarkable height of perfection. The material of this department has been kindly lent to the Council of the German Educational Exhibition by:

1. The natural history-museums in Altona, Bremen, Berlin, Darmstadt, Hamburg, Heligoland, Stuttgart.
2. The museums of the Universities of Berlin, Breslau, Leipzig, Heidelberg, Munich, Würzburg.
3. The Kgl. bayerische biolog. Versuchsstation für Fischerei in Munich.
4. The manufacturers of scientific models P. Osterloh at Leipzig-Gautzsch and Fr. Ziegler at Freiburg i. Br.
5. The Institute of lithographic arts of Werner and Winter, Frankfort on the Main.

I. Preparations for the study of systematic Zoology.

1. Fox, *Canis vulpes* var. albescans. Museum Stuttgart.
2. Wild cat, *Felis catus ferus.* Museum Stuttgart.
3. Young tigers, *Felis tigris,* male and female. Museum Stuttgart.
4. Antelope, *Antilope cervicapra* pull. Museum Stuttgart.

   These four animals have been prepared by Inspector Kerz, Museum Stuttgart, who is considered the best German taxidermist.
5. Muskdeer, Chevrotain, *Tragulus,* prepared by the Museum in Darmstadt.
6. The taxidermic skeleton of No. 5, made out of wood and turf, before the skin is put on. The wood was modeled by a „Fraiser apparatus“, which is driven by electricity and works very quickly.
7. Photograph of this apparatus as constructed by Prof. G. von Koch in Darmstadt and a pamphlet on it by the same.
8. Eight stuffed gannets, *Sula piscatrix,* in different plumage from the coral island of Laysan (Sandwich Islands). Museum Bremen.

9. Mountain lizard, *Lacerta vivipara,* with eleven young ones just after birth. Museum Hamburg.
10. Common viper, *Vipera berus,* the only poisonous snake in Germany, in a natural position on a stone. Museum Berlin.
11. Skeleton of a Hexactinellid, siliceous sponge, *Pheronema raphanus,* found by the German Deep-sea Expedition. Museum of the University of Berlin.
12. Two specimens of another deep-sea Hexactinellid sponge, *Monoraphis chuni,* found by the Valdivia expedition, which fixes itself into the deep-sea-ooze by means of a siliceous stick of over a meter in length. Museum University Berlin.
13. Three skeletons of a deep-sea siliceous sponge, *Aphrocalistes beatrix.* These have been prepared by boiling the animals in strong sulphuric acid. Zoological Institute of the University of Berlin.
14. Salmon, *Salmo salar.* A specimen about four years old and 65 cm. long from the river Elbe near Hamburg. It has been arranged in a swimming position after the method first introduced by the Hamburg Museum (1890), and afterwards adopted by other museums. The colours, which had been lost through the animal having been preserved in alcohol, have been replaced by watercolours in a most natural way. The colours have not changed since 1896 when the speccimen was prepared by Dr. M. von Brunn, Museum Hamburg.
15. European brook trout, *Salmo fario,* about three years old, 35 cm. long, bred at Hamburg and prepared like No. 14 by Dr. von Brunn 1903. Museum Hamburg.
16. Rainbow trout, *Salmo irideus,* three years old, 39 cm. long, bred at Hamburg and prepared by Dr. von Brunn 1903. Museum Hamburg.
17. American brook trout, speckled trout, *Salvelinus fontinalis.* Three years old, bred at Hamburg. Museum Hamburg.
18. Pamphlet written by Dr. M. von Brunn, Hamburg, on the artificial colouring of alcohol-preparations: Ein Beitrag zur Museumstechnik. Mit einer Lichtdrucktafel (Abhandlung, herausgegeben vom Naturwissenschaftlichen Verein, Hamburg, Band XIII, 1895). Translated by: Meek, S. E., A contribution to museum technique. American Naturalist, Vol. XXXVI, pag. 53—61. Boston 1902.

19. Deepsea seapen, *Pennatulide.* Valdivia-Expedition. Museum Breslau.
20. Deepsea asteroid polyp (Alcyonaria), *Paraspongodes antarctica.* Valdivia Expedition. Museum Breslau.
21. Deepsea asteroid polyp (Alcyonaria), *Spongioderma verrucosa.* Valdivia Expedition. Museum Breslau.
22. Sea-anemone (*Zoanthus*) on Hermitcrabs. Valdivia-Expedition. South Atlantic. 981 m. Museum Leipzig.
23. Two Ctenophora, *Beroe ovata* and *Cestus veneris*, preserved by the Naples Zoolog. Station.
24. Heteropode, *Pterotrachea mutica*, preserved by the Naples Zoolog. Station.
25. Sea-snail, *Vermetus gigas*, preserved by the Naples Zoolog. Station.
26. Jelly-fish, *Rhizostoma pulmo*, preserved by the Naples Zoological Station.
27. Deepsea sea-urchin, *Palaeopneustes niasicus.* Valdivia-Expedition. Bay of Nias. 470 m.
28. Heteropode, *Carinaria mediterranea*, preserved by the Naples Zoolog. Station.
29. Sea-snail, *Pleurobranchea meckelii*, preserved by the Naples Zoolog. Station.
30. Sea-anemone, *Adamsia rondeletii*, preserved by the Naples Zoolog. Station.
31. Dead-men's fingers, *Alcyonium digitatum*, German Ocean. Biol. Station Heligoland. Formalin.
32. Compound ascidian, *Polycyclus renierii*, preserved by the Naples Zoolog. Station.
33. Siphonophore, *Halistemma rubrum*, preserved by the Naples Zoolog. Station.
34. Deepsea crab, *Pleistacantha*-species, Valdivia-Expedition.
35. Deepsea fish, *Lamprogrammus niger.* Surrat Passage 1024m. Valdivia Expedition.
36. Depsea fish, *Coloconger raniceps.* Pemba-Channel. 818 m. Valdivia-Expedition.
37. Deepsea fish, *Neobythites nigripennis.* Coast of East Africa. 693 m. Valdivia Expedition.
38. Deepsea shrimp, *Aristaeopsis*-species. Coast of East Africa. 977 m. Valdivia-Expedition.
39. Deepsea seapen, *Amphiacme abyssorum.* Valdivia-Expedition.

40. Deepsea asteroid polyp, *Chrysogorgia*-species Valdivia-Expedition.
41. Deepsea seapen, *Umbellula pellucida.* Valdivia-Expedition.
42. Deepsea seapen, *Veretillum*-species. Valdivia-Expedition.
43. Deepsea crab, *Platymaia wyville-thompsoni.* Valdivia-Expedition.
44. Deepsea crab, *Homalochunia valdiviae.* Valdivia-Expedition.
45 and 46. Deepsea-crab, *Geryon affinis,* male and female. Valdivia-Expedition.
47. Deepsea seapen, *Chunella gracillima.* Valdivia-Expedition.
48. Two annelides, *Eunice gigantea* and *Phyllodoce paretti,* preserved by the Naples Zoolog. Station.
49. Shell of a large sea-snail, *Tritonium tritonis,* with names of the different parts. Museum Berlin.
50. The same cut through longitudinally with names of the inner parts. Museum, Berlin.
51. Common whelk, *Buccinum undatum,* with eggs. Museum Heligoland.
52. Sea-snail, *Purpura lapillus,* with eggs. Museum Heligoland.
53. Jelly-fish, *Chrysaora isosceles,* in Formalin. Museum Heligoland.
54. Jelly-fish, *Rhizostoma cuvieri,* in Formalin. Museum Heligoland.
55. Leech, *Clepsine tesselata.* Museum Heidelberg.
56. Larva of a longicorn beetle, *Cerambyx cerdo.* Museum Berlin.
57. Sea-cucumber, *Holothuria tubulosa,* preserved by the Naples Zoolog. Station.
58. Sea-pen, *Pennatula rubra,* preserved by the Naples Zoolog. Station.
59. Sea-lemon *(Aeolis rufibranchialis)* on a Hydroid polype *(Hydrallmania falcata).* Biol. Station Heligoland.
60. Red Coral, *Corallium rubrum,* preserved by the Naples Zoolog. Station.
61. Sea-shrub, *Gorgonia cavolinii,* preserved by the Naples Zoolog. Station.
62. Hydroid polype, *Tubularia larynx,* preserved by the Naples Zoolog. Station.
63. Sea-star, *Luidia ciliaris,* preserved by the Naples Zoolog. Station.

64. Dead-men's fingers, *Alcyonium palmatum,* preserved by the Naples Zoolog. Station.
65. Mussel, *Solecurtus strigillatus,* preserved by the Naples Zoolog. Station.
66. Ascidian, *Ciona intestinalis,* preserved by the Naples Zoolog. Station.
67. Barnacle, goose-mussel, *Lepas anatifera,* preserved by the Naples Zoolog. Station.
68. Jelly-fish, *Aequorea forskalii,* preserved by the Naples Zoolog. Station.
69. German Amphibia, formed in plaster of Paris and painted. Museum Darmstadt.
70. German slugs, modeled from life in plaster of Paris and painted. Museum Darmstadt.
71. Sea-lemon, *Aeolis papillosa.* Museum Heligoland.
72. Sea-slug, *Doris tuberculata* with snail, *Tritonia hombergi.* Museum Heligoland.
73. *Salpa pinnata,* solitary and chain. } preserved by the Naples Zoological Station.
A species of Bryozoa, *Myriozoum truncatum.* } preserved by the Naples Zoological Station.

II. Anatomical Preparations and Models.

74. Model of the gill-chamber-region of the Amphioxus. Painted wood. Museum Würzburg.
Model of an Ascidian. Painted wood. Museum Würzburg.
75. Wooden model of a Hydromedusa. Museum Würzburg.
76. Model of Nucleus-division. Stage of the equatorial plate. Museum Würzburg.
77. Model of Nucleus-division. Stage of the Metakinese. Museum Würzburg.
78. Imitation of the skull of gorilla. P. Osterloh, Leipzig-Gautzsch. Price 18 M. = $\$\,4^{1}/_{2}$.
79. Model of the head and mouthparts of an *Anopheles.* P. Osterloh. Price $\$\,22^{1}/_{2}$.
80. Two models of the trunk of a house-fly. Museum Altona.
81. Model of a bee. P. Osterloh. Leipzig-Gautzsch. Price $\$\,33^{3}/_{4}$.
82. Model of the common fresh-water Mussel, *Unio timidus.* By the same. Price \$ 30.
83. Model of a reef-coral. By the same. Price \$ 15.

84. Skeleton of the pectoral fin of a cod.
85. Skeleton of the fore-limb of a turtle.
86. Skeleton of the foot of an eagle.
87. Skeleton of the fore-foot of a roebuck.
88. Skeleton of the fore-foot of a dog.
89. Skeleton of the fore-foot of a monkey.
90. Skeleton of a human hand.

Museum Altona.

91. Transverse sections through the fresh-water pearl-mussel (*Margaritana margaritifera)*. Museum Heidelberg.
92. Giant spider, *Mygale*, dissected, with drawing. Museum Hamburg.
93. Transverse section through the trunk of an elephant, modeled in plaster of Paris. Museum Darmstadt.
94. Chamaeleon, tongue.
95. Chamaeleon, lung-sacs.
96. Chamaeleon, feet.
97. Chamaeleon, intestines, with drawing.

Museum Berlin.

98. Model of the human ear. Two parts. P. Osterloh. Leipzig-Gautzsch.
99. Preparations of a bird's wing: the bones, the bones with the feathers, the complete wing. Museum Altona.
100. Duck plucked on one side to show the difference between the „clothing-feathers“ and the „down-feathers“. Museum Altona.
101. Gull, *Larus canus,* with the names of the surface parts of the body. Museum Berlin.
102. Gull, *Larus argentatus,* skeleton with the names of the parts. Museum Berlin.
103. Pigeon, *Columba domestica.* Transverse sections. Museum Heidelberg.
104. Anatomy of the hagfish, *Myxine glutinosa.* Museum Heidelberg.
105. Anatomy of the *Clupea alosa.* Museum Heidelberg.
106. Ovary of an eel, *Anguilla anguilla,* of 75 *cm* length. Dr. von Brunn praep. 1895. Museum Hamburg.
107. Testes of a male eel. The male genital organ was first discovered and rightly interpreted by Syrski at Triest in 1873/74, while the female organ had been found almost simultaneously by Moudini and Müller,

at the end of the 18. century. Both preparations are explained by a drawing of natural size. Museum Hamburg.

108. Stomach of the eel-pout, *Lota vulgaris,* with appendices pyloricae. Museum Bremen.

109. Stomach of a cod, *Gadus morrhua,* filled with cray-fishes, *Nephrops norvegicus.* Museum Heligoland.

110. Nervous system and swimming bladder of the tench *Tinca vulgaris.* Museum Leipzig.

111. Nervous system and electric organs of the electric ray, *Torpedo ocellata.* Museum Leipzig.

112. Anatomy of the blind-worm, *Anguis fragilis.* Museum Leipzig.

113. Anatomy of a female frog, *Rana esculenta,* with photograph. Museum Bremen.

114. Movable model to show how the twisted nervous system of a snail may have developed from a symmetrical state. Museum Heidelberg.

115. Horn of an ox, cut through longitudinally. Museum Berlin.

116. Back-horn of *Rhinoceros bicornis,* the two-horned rhinoceros. Section. Museum Berlin.

117. Skeleton of a giant frog, *Rana mugiens,* dissected. Museum Heidelberg.

118. Sections through the eye of a buzzard, *Buteo vulgaris.* Museum Heidelberg.

119. Stomach of a swan. Museum Bremen.

120. Common round-worm, *Ascaris lumbricoides:* female genital organs. Museum Heidelberg.

121. Locust-shrimp, *Squilla mantis,* dissected. Museum Heidelberg.

122. Locust-shrimp, *Squilla mantis,* nervous system. Museum Heidelberg.

123. Centipede, *Scolopendra subspinipes.* Parts of the mouth dissected. Museum Berlin.

124. Stick-insect, *Bacillus rossii,* dissected. Museum Berlin.

125. Biology of the mole-cricket, *Gryllotalpa gryllotalpa:* in a vertical section through the earth a natural picture is given of the subterranean holes, in which the eggs are placed and developed to larvae, nymphs and imagines. E. Stender and J. Itzerodt praep. Museum Hamburg.

126. Axis-deer, *xis Aaxis:* three vertebrae of the neck with the names of the different parts. Museum Berlin.
127. Skull of the beaver, *Castor fiber,* cut through to show the position of the incisors. Museum Berlin.
128. Skull of a dog, changing teeth. Museum Berlin.
129. Five preparations of the veins in the wings of butterflies. Museum Berlin.
130. Dry preparation of the anatomy of the common snail, *Helix pomatia,* after Semper's method. Museum Würzburg.
131. Caterpillar of the silk-butterfly, *Bombyx mori.* Preparation of the tracheae. Museum Berlin.
132. Nervous system of the stag-beetle, *Lucanus cervus.* Museum Berlin.
133. Cast epidermis of a land-salamander, *Salamandra maculosa.* Museum Heidelberg.
134. Fresh-water mussel, *Margaritana margaritifera:* layers of the shell. Museum Heidelberg.
135. Sea-urchin, *Echinus esculentus,* with injected ambulacral system. Museum Heidelberg.
136. Sea-star, *Asterias rubens* with injected tube-feet. Museum Heidelberg.
137. Brain of the *Alligator mississippiensis.* Museum Heidelberg.
138. Brain of the dog, filled with wax, with the names of the various parts. Museum Berlin.
139. Dry preparation of the injected arteries of a rabbit. Museum Heidelberg.
140. Thorax of the cat with internal organs, dried after Semper's Method and painted. Museum Darmstadt.
141. Intestines of the cat, as No. 140. Museum Würzburg.
142. Sections through the vertebral column of a shark, *Lamna cornubica.* Museum Hamburg. By double-staining with carmine and chromic acid the different tissues are distinctly marked: cartilage bluish, Chorda dorsalis unstained. Dr. Michaelsen praep. 1893.
143. Elephant's head skinned. Modeled in plaster of Paris. Museum Darmstadt.
144. Cat, five cross sections through the frozen body, dried after Semper's Method. Museum Darmstadt.
145. Muscles of a cat, modeled in plaster of Paris. Museum Darmstadt.

III. Embryological Preparations and Models.

146. Yellow-hammer, *Emberiza citrinella*, moulting the tail. Museum Berlin.

147. Bustard, *Otis tarda,* feathers worn out by use. Museum Berlin.

148. Sparrow, *Passer domesticus,* moulting the tail. Museum Berlin.

149. Common fowl, *Gallus domesticus,* moulting the wings. Museum Berlin.

150. Sparrow, *Passer domesticus,* moulting the tail. Museum Berlin.

151. Gannet, *Sula sula*, moulting the tail. Museum Berlin.

152. Swan-goose, *Anser cygnoides,* moulting the wings. Museum Berlin.

153. Pheasant, *Phasianus colchicus,* 34 days old, moulting the tail. Museum Berlin.

154. Pheasant, *Phasianus colchicus,* 6 days old, moulting the wing. Museum Berlin.

155. Chough, *Graculus graculus,* moulting the tail and the wings. Museum Berlin.

156. Model of a young human embryo, magnified 100-times, made of papier mâché by to *P. Osterloh,* Leipzig-Gautzsch.

157. Stages of the development of the trout and the salmon in Formalin Glycerine.
    I. Trout, *Salmo fario.* a) Eggs before beginning to develop; b) young fish just hatched; c) ready to be put into the stream.
    II. Salmon, *Salmo salar.* a) eggs before hatching; b) young fish just hatched; c) ready for being placed in the brooks.

    The transparency and form of the eggs have not changed; young fish in a swimming position. After a special method prepared and arranged by Dr. von Brunn, Museum Hamburg 1896.

158—170. Wax models of Friedrich Ziegler, establishment for scientific plastic art. Freiburg i. Br., founded 1852.

161—164. Four models of the embryonic head-skeleton of *Rana fusca* (No. 164), *Lacerta agilis* (No. 163), *Gallus* *domesticus* (No. 162) and *Homo sapiens* (No. 161) after the reconstruction-models of Prof. Gaupp, Prof. Tonkoff and Prof. O. Hertwig.

In all four models the primordial cranium, which is about at the highest stage of its development, has been represented with its primordial bones, while on the right side the membrane bones are shown. Thus one can see the relations of the different parts of the head-skeleton at a glance and one is able to judge the part they play in the composition of the whole skull. Comparing the four models one recognises the important fact that the primordial cranium in each case is built up after the same plan however different the skulls are in the definite stage. Each of them possesses the same four regions (occipital, labyrinthal, orbital and ethmoidal), and the differences between them are easily to be found out. For instance by comparing the cranium of a frog with that of a lizard or a fowl one can see the difference between a platy-basal (i. e. with a flat basis of the skull) and a tropibasal skull (i. e. with a septum interorbitale, lying like a keel under the front part of the skull); the comparison of the human cranium with the others shows clearly that the cranium of a mammal resembles more that of a reptile than that of an amphibian. Regarding the bones, the models clearly demonstrate which parts of the chondrocranium are replaced by the primordial bones, and the position of the membrane bones and their relation to the primordial cranium. Thus the models are of the greatest importance for a comparative anatomical study of the skeleton of the head. They give an insight into the construction and development of the skull which the study of the macerated bones of an adult skull can never afford.

165, 166. Models to show the development of the heart of a mammal after the reconstructions of Prof. Dr. G. Born.

The first part (No. 165) of this series (11 models) shows the development of the heart of a rabbit, the second (No. 166) (3 models) that of the human atria of embryos 36 *mm.* and 310 *mm.* in length. By the 14 models the whole development of the mammalian heart from the tube like stage up to the fully developed state may be demonstrated. One sees how the simple tube is divided and how its cavity is separated into four chambers. One may observe the complicated formation of the atrial septum, the disappearance of the left venous valve and the transformation of the right into the Valvula Eustachii and Valvula Thebesii. Moreover one sees how the septum of the Bulbus arteriosus moves down into the ventricles (Pars membranacea septi), how the semilunar and atrio-ventricular valves are developed, how the originally symmetric arrangement of the aortic vessels is gradually lost and what parts of them are destroyed.

167, 168, 169. Three models of the Embryology of the swine, after the reconstructions of Prof. Keibel. The models may be taken to pieces.

This series shows the embryonic shield of a swine with the first appearance of the primitive streak; the embryonic shield with the first appearance of the medullar groove and finally an embryo with 10 primitive mesodermal segments, and a medullar groove which is just beginning to close. One can see the first signs of the eyes, the heart, the first gill slit, the Wolffian duct and the formation of the allantois. The models not only give a picture of the outward form, but also consist of several sections, which allow the comparison of the exterior with the interior organisation. Thus they are a great help to embryological lectures.

158, 159, 160. Models of the development of the teeth of reptiles (*Crocodilus porosus*) after the reconstructions of Dr. C. Röse.

The dental development of crocodiles is of special importance as they show firstly a very primitive stage, reminding one of the placoid scales of the shark, and secondly the formation of thecodont teeth, which are similar to those of mammals. The primitive teeth possess dentine and at their basis a cement foundation of very fine bone tissue at a time when no vestige of bone is to be found in other parts of the body. The jawbones originate independently from the teeth in the mesoderm. Later on the dental lamina is formed by an invagination of the epithelium and this gives rise to the beginning of the following series of teeth.

170. Five models of the development of Torpedo occellata.

The first model shows the blastoderm with the embryonic shield, the second and third the formation of the medullar-plate and the medullar-groove, besides blood-islands near the margin; in the fourth model the groove is closing leaving only open at the front extremity the Neuropore and at the back the Canalis neurentericus. The fifth model represents a far more advanced embryo with gill slits, auditory capsule, mesodermal segments and the concrescence of the margins of the blastoderm behind the embryo.

171. Four embryos of a gannet, *Sula piscatrix,* from Laysan Island. Museum Bremen.

172—174. Three models of the skull-development of *Sphenodon punctatus* made by P. Osterloh, Leipzig-Gautzsch, of papier mâché, after the investigations of Prof. Schauinsland.

172. Early stage, magnified 60 times. Price $ 22$^1/_2$.
173. Middle stage, magnified 60 times. Price $ 30.
174. Late stage, magnified 40 times. $ 25.
175. Seven stages of the development of the plumage of the spotted redshank, *Totanus fuscus* from the downs up to the full dress. Museum Altona.

IV. Pathological and Biological Preparations.

176. Four forefeet of the swine, *Sus scrofa,* with supernumerary toes. Museum Berlin.
177. Ten boxes with biological preparations of butterflies. Museum, Stuttgart.

178—187. Preparation of fish diseases, exhibited by Prof. Hofer from the Royal Bavarian Biological Station for Fisheries, Munich.

178. Carp shedding its skin owing to a cold.
179. Smallpox-disease of the carp.
180. *Ichthyophthirius*-disease of the tench, *Tinca vulgaris.*
181. *Leuciscus rutilus* with *Diplostoma cuticola.*
182. Carp with thickening of the lateral line.
183. Furunculosis of salmon.
184. Seven salmon embryos with contracted yolk-sack.
185. Embryo of *Trutta fario* with dropsy of the yolk-sack.
186. Carp with defective gill-cover.
187. Stickleback, *Gasterosteus aculeatus,* with tubercles of *Nosema anomalum.*

190. Biological preparation: burying-beetles and carrion-beetles burying a mole and a mouse, in order to lay their eggs in the dead animals. Besides the burying-beetles (*Necrophorus, Necrodes* etc.) other carrion-beetles (*Hister, Ocypus, Staphylinus*) make use of the corpses for the same purpose. E. Stender and J. Itzerodt praep. Museum Hamburg.

191. Earth channels of the mining-spider, *Cteniza sauvagei*, from Corsica. Museum Bremen.

192. Stag-beetle, *Lucanus cervus*, different stages of the metamorphosis. Museum Berlin.

193. Lobster with empty shell. Regeneration of the two pincers. Museum Heligoland.

194. Lobster just before casting its shell and regenerating the pincers. Museum Heligoland.

195. Transverse sections through the cephalothorax of a lobster. Museum Heidelberg.

196. Lobster regenerating a pincer, a feeler and two legs. Museum Heligoland.

197. Empty carapace of a lobster with regeneration of a feeler. Museum Heligoland.

198. The same (No. 197) just after having thrown off the carapace. Museum Heligoland.

199. *Pholis gunellus*, butter-fish, with egg-cluster in an empty oyster. Museum Heligoland.

200. *Cottus bubalis*, father-lasker, with egg-cluster on a chalk-stone. Museum Heligoland.

201. Tick, *Ixodes erinacei*, on the head of hedge-hog. Museum Hamburg.

202. Sea-anemones, *Actinia equina*, on stones. Museum Heligoland.

203. Maps of distribution in different sizes. Museum Berlin.

204. Guide to the zoological collections of the Berlin Museum.

205. Guide to collecting, preserving and packing animals for the Zoolog. Museum in Berlin. Second edition. 1902.

V. Biological Groups and Pictures along the Walls.

206. Noxious insects and plants injured by them. Museum Hamburg.

The plants have been dried in sand and painted with oil-colours. 1. *Cynips fecundatrix,* a gall-fly living on the oak-tree, with six galls opened to show the larvae. 2. *Lyda campestris,* a saw-fly, living on Scotch pines. 3. *Schizoneura lanigera,* the most dangerous foe of the apple-tree. One branch is entirely covered by the wax which the lice secrete for their protection. Dr. v. Brunn praep.

207. Noxious insects and plants injured by them. Museum Hamburg.

1. *Urophora cardui,* a fly boring in the common thistle (*Cirsium arvense*) and causing galls. 2. *Oligotroptus artemisiae,* a gall-gnat, deforming the twigs of *Artemisia campestris.* 3. *Phytoptus laticinctus,* a gall-mite, causing deformations of *Lysimachia vulgaris.*

208. Butterflies in a mirror-box, showing both sides at the same time. Museum Hamburg.

209. Butterfly, *Araschnia levana.* 50 colour-varieties produced artificially by change of temperature and thus explaining the "seasonal dimorphism". Museum Berlin.

210. Different forms of the feelers of insects. Museum Berlin.

211. Longicorn-beetle, *Cerambyx cerdo,* borrowing in the wood of oak-trees.

212. Case with five species of beetles demonstrating the variability of size. Museum Hamburg.

213. 214. Butterflies, *Catocala nupta* and *fraxini,* on pieces of bark to show the protective colouring. Museum Bremen.

215. Variability of the shells of the common snail, *Helix pomatia.* Museum Stuttgart.

216. Three magnifying glasses with microscopic preparations for the purposes of a public museum. Museum Altona.

217. Microscope for a museum after the construction of the mechanician of the Hamburg museum, Mr. E. Vollmer. One of the common "lecture-microscopes" is placed horizontally and carries in front of its objective-lens a movable disk of about 30 cm. in diameter, on the margin of which twelve microscopic slides are fixed by screws. This disk may be turned by the visitors by means of a lateral lever in such a way that one preparation after the other is brought before the lens and at each turn a number

becomes visible which corresponds with the number of the explanation. The whole is protected by a cover of iron-plate.

218. Biological group: dung-beetles (*Geotrupes, Aphodius, Sphaeridium*) and dung-flies (*Scatophaga*) on the excrements of sheep and oxen. E. Stender and J. Itzerodt praep. Museum Hamburg.

219. Biological group: Green woodpecker, *Picus viridis*, sitting in the hole it has made in a tree. Museum Altona.

220. Biological group: Grey-headed woodpecker, *Picus canus*, in winter feeding on ants. Museum Altona.

221, 222. Two biological groups of birds in the same position, showing the differences of the plumage in spring and in autumn. Museum Altona.

223. Biological group: Common viper, *Pelias berus*, and hedgehog. Museum Altona.

224. Biological group of the fire-bellied toad, *Bombinator igneus* (cast of plaster of Paris). Museum Altona.

225. Biological group of the magpie-moth, *Abraxas grossulariata.* Museum Altona.

226—28. Werner and Winter, Lithographic establishment, Frankfort on the Main.

226. Two books, each with 90 plates published in zoological, botanical and medical works.

227. Ten pictures with plates taken out of the papers of German, French, English, Italian, Russian etc. authors.

228. Twelve plates with fishes, taken from Grote, Vogt und Hofer, Die Süsswasserfische von Mitteleuropa.

229. Four photographs of large biological groups in the Altona Museum.

230. Map of the earth with the colours used for the different regions of animal geography. Museum Berlin.

231. Common stag, *Cervus elaphus.* The different tracks of the feet in sand. Museum Berlin.

232. Twelve photographs taken from life of the eggs of some fish found in the German ocean. Museum Heligoland.

233. Three large cardboards with photographs of mammals which have been stuffed and arranged by Mr. Kerz, inspector at the Stuttgart Museum.

234. Two papers on plancton by R. Volk: 1. Die bei der Hamburger Elb-Untersuchung angewandten Methoden zur quantitativen Ermittlung des Planctons. Mit 3 Tafeln und 12 Textfiguren. Hamburg 1901. 2. Hamburgische Elb-Untersuchung. I. Allgemeines über die biologischen Verhältnisse der Elbe bei Hamburg und über die Einwirkung der Sielwasser auf die Organismen des Stroms. Mit 6 Tafeln und 1 Karte. Hamburg 1903.

Botanical Department.

The exhibition ot the Royal Botanic Garden and Museum of Berlin was prepared with the object of giving some idea of

1. the scientific work of the staffs of the two institutes, as represented by the publications in the principal branches of their departments,
2. the laying out and constructing of the New Royal Botanic Garden and Museum,
3. the economic plant-products of the German colonies.

I. The scientific work of the staff of the Royal Botanic Garden and Museum.

The nucleus of the Botanic Museum was the herbarium of Willdenow, which was purchased by the government in 1818, when Schlechtendal was appointed curator of the collections. His successors, Adelbert von Chamisso (the well-known poet and traveller), Klotzsch, Kunth, Link, Alexander Braun, Eichler, made every effort to increase the collections and were constantly engaged together with their staff arranging the botanical treasures gathered in Berlin. The results of their studies are recorded in numerous papers, and the continual increase in the estimation in which these papers were held among scientific men is evidence of the great part the Institute played in the history of Botany. The acquiring of colonies by the German empire as well as the sending abroad of numerous botanical collectors proved to be of the greatest value to the establishment, which thereby acquired a hitherto quite unsuspected abundance of new species. For that reason, the staff of the museum, though substantially augmented since the appointment of Prof. A. Engler, the present director, wants all its energy to cope with the masses of material always coming and to make known the results o the scientific world.

Works exhibited:

A. A number of works devoted to general systematic botany, e. g:

Engler-Prantl, Die natürlichen Pflanzenfamilien (the natural orders of plants). This voluminous and copiously illustrated work was commenced in 1888 and will be completed before long. Numerous botanists have contributed to its contents. It has gained not only a very large circulation in scientific circles, but it is much used by teachers, physicians, pharmacists and gardeners.

Regni vegetabilis conspectus, das Pflanzenreich (the vegetable kingdom). This work has a much wider scope than the „Pflanzenfamilien". Published under the auspices of the Royal Academy of Sciences of Prussia, it is edited by A. Engler since 1900 and will be a complete collection of monographical accounts of the natural orders, containing an enumeration and description of all species of the vegetable kingdom.

Dalla Torre et Harms, Genera Siphonogamarum (Genera of siphonogamous plants) is indispensable as a directory of the nomenclature of the genera; its conclusion, comprising the alphabetical index, is to be issued at an early date.

Engler, Syllabus der Vorlesungen über spezielle und medizinisch-pharmazeutische Botanik (Syllabus of lectures on systematic and pharmaceutical Botany). — This is a concise summary of the systematic arrangement adopted in the three preceding works, some alterations necessitated by recent researches having been introduced.

Schumann, Lehrbuch der systematischen Botanik (Handbook of systematic botany).

Schumann and Gilg, Das Pflanzenreich (Vegetable kingdom).

B. Periodicals published by members of the staff of the Botanic Museum.

Engler, Botanische Jahrbücher (Botanical Yearbooks), founded in 1881 with the view of promoting systematic botany and phytogeography in the broadest meaning of the words.

Notizblatt des Königlichen botanischen Gartens und Museums zu Berlin (Bulletin of the Royal Botanic Garden and Museum in Berlin) contains shorter notes mostly on economic plants or the vegetable resources of the colonies.

Hedwigia, now being edited by **G. Hieronymus** and **P. Hennings,** is devoted entirely to cryptogamic subjects.

Botanischer Jahresbericht (Annual review of botanical literature), which was founded by **Just** and is edited by **K. Schumann** at the present time, the only periodical which gives a complete review of botanic literature.

C. Systematic accounts dealing with single plant-orders only.

The works of **K. Schumann** devoted to Cactaceae, viz: 1. **Gesamtbeschreibung der Kakteen** (A Monograph of Cactaceae); 2. **Icones Cactacearum** or **Blühende Kakteen** (Flowering Cactaceae), a periodical work containing coloured plates, issued in single parts; 3. **Monatsschrift für Kakteenkunde** (Monthly review of the knowledge of Cactaceae), and several other smaller works on Cactaceae.

Loesener: Monographia Aquifoliacearum; Urban: Monographia Loasacearum; Engler: Die geographische Verbreitung der Rutaceen; Engler: Die geographische Verbreitung der Zygophyllaceen (Geographical distribution of Rutaceae and Zygophyllaceae); **Hennings: Fungi Monsunenses.**

D. Works on general phytogeography.

Engler, Versuch einer Entwicklungsgeschichte der Pflanzenwelt, insbesondere der Florengebiete seit der Tertiärperiode (The evolution of the vegetable kingdom and especially of the phytogeographical provinces since the tertiary period). **Engler, Die Entwicklung der Pflanzengeographie in den letzten hundert Jahren und weitere Aufgaben derselben** (The development of phytogeography in the last century and its further problems).

E. Works on special phytogeography and Floras of single provinces.

1. Here the publications dealing with the flora of Tropical Africa are of particular interest. The rich collections obtained by botanists and travellers in the German possessions of both western and eastern Africa are just now absorbing the attention of the staff of the Museum to a large extent. From two decades

ago up to the present time the authorities have been kept engaged on the description and publication of the novelties discovered in Africa. Most of the descriptions are laid down in

Beiträge zur Flora von Afrika (Contributions to the Flora of Africa), published in Engler's Botanische Jahrbücher. **Monographien afrikanischer Pflanzen - Familien und - Gattungen** (Monographs of orders and genera of African Flora), published under the auspices of the Royal Academy of Prussia by **A. Engler.**

Die Pflanzenwelt Ostafrikas (The Plant-world of Eastern Africa), edited by **A. Engler** again assisted by the staff of the Museum. — This book, another result of the studies on African flora, is intended to give a comprehensive account of our present knowledge on the subject, including a catalogue of the species, a phytogeographic part and a discussion of the economical plants.

Engler, Die Hochgebirgsflora von Afrika (The Flora of the High Mountains of Africa).

Engler, Die Gliederung der Vegetation von Usambara (The Plant-Formations of Usambara).

Volkens, Der Kilimandscharo.

2. The Flora of Europe, or more especially of Germany, is the subject of the following works:

Richter-Gürke, Plantae europaeae (Plants of Europe). Garcke, Illustrierte Flora von Deutschland (Flora of Germany). Ascherson und Graebner, Synopsis der mitteleuropäischen Flora (Synopsis of the Flora of Central-Europe). **Ascherson and Graebner, Flora des nordostdeutschen Flachlandes** (Flora of Northeastern Germany). **Graebner, Botanischer Führer durch Norddeutschland.** (Botanic Guide through Northern Germany).

3. Other regions of the world are treated by **Urban, Symbolae Antillanae.** From the large work, **Flora Brasiliensis** edited at present by **J. Urban,** several selected plates are added to the exhibition.

F. Works from other branches of botany.

Schumann, Neue Untersuchungen über den Blütenanschluss (New researches on the local connections of floral parts); **Schumann, Morphologische Studien** (Morphological Studies); **Schumann and Meyer, Atlas officineller Pflanzen** (Atlas of officinal plants); **Lindau and Haseloff, Handbuch der Beschädigungen der Vegetation durch Rauch** (Handbook of the injurious effects of smoke on vegetation); **Gilg, Schule der Pharmacie** (School of Pharmacy).

2. The New Botanic Garden and Museum at Dahlem.

The ground occupied hitherto by the Royal Botanic Garden in Berlin was originally (in the middle of the 17th century) planted with hops for the Electorial Brewery. Afterwards, in the reign of Frederic William, the Great Elector, it was changed into an orchard and kitchen-garden. In the reign of King Frederic the First, when greenhouses were erected and an orangery was added, the establishment became a flower-garden. Not earlier than in 1801, when Willdenow was appointed director, a really botanical garden was created. During the term of office of his successors Link, Braun, Eichler and Engler, the Garden was extended to its present area, somewhat above 11 hectars. In more recent times, however, especially in the two last decades, the garden being more and more surrounded by the houses of the city, he deteriorated so much owing to the injurious effects of their surroundings that the prospect for the time to come was very unsatisfactory. Moreover, the condition of most of the greenhouses was very bad, and it seemed as if they would have to be rebuilt at no distant date.

For these reasons the Government determined to change the site of the garden, as suggested by Dr. Althoff, Director of the Ministry for Education. Owing to his energy, the lengthy negociations with the Ministry of Finance and the Administration of "Royal Domaines" (i. e. crownlands) were carried to a successful end. An area of 42 hectars selected by the directors of the Botanical Garden and other competent judges was granted for laying out the new Botanical Garden. The construction was commenced in 1898 and proceeded so well during the following years that the whole arrangement, the large glass-houses excepted, is now completed.

The Garden contains the following departments:

1. The Phytogeographical Department. — In this department, the rockeries containing the flora of high mountains and alpine regions are an especially conspicuous feature.
2. The Arboretum. This is to be a complete collection of trees and shrubs which can be grown in the German climate.
3. The Systematic Department. This is to represent the majority of natural orders.
4. The Morphological and Biological Groups. These show very instructively the adaptability of plants to the various conditions of life.
5. Medicinal, Poisonous and Economical Plants.
6. The Plant Houses, partly to be open for the public, partly reserved for propagating or cultivating purposes.
7. The buildings of the administration and the lodgings of the gardeners.

The map to be seen in the exhibition will give an idea of the whole construction. Some of the rockeries are shown in photographs.

The new Botanical Museum is to be erected in the north-west-corner of the garden, containing the herbarium, the show-rooms, the working-rooms of the staff, the lecture-rooms and laboratories provided for the students. It is hoped, that the Garden and Museum will be quite complete in 1906.

3. The Exhibition of the Plant-products of the German Colonies.

In preparing this exhibition of plant-products of the German Colonies, it was by no means intended to form a representative collection of all the vegetable resources of these countries. It was thought advisable rather to restrict it to a small selection of objects likely to be of some particular interest. Even those are represented by dried objects only, as fruits, seeds, timbers, gums, resins, because practical reasons rendered it impossible to expose the objects preserved in spirit -- of which there is a large stock in the Berlin Museum -- to the difficulties of transport.

Moreover, with a few exceptions, all the more common products of tropical agriculture are omitted from the collection;

larger quantities of such will be found in other departments of the Exhibition.

The products are arranged separately for each colony.

I. Togo.

1. **Alimentary Plants**: The cereals Andropogon sorghum, „Durra", cultivated by the natives in many varieties, and Pennisetum spicatum „Spiked Millet", „Negerhirse". Fruits of Parkia africana, the edible embryos of Adansonia digitata, the Monkey Bread tree, and the edible sclerotium of a fungus, Lentinus tuber-regium.
2. **Plants supplying beverages**: Cola vera and Cola acuminata, producing the cola-nuts very popular throughout the Soudan; Garcinia cola, the „bitter" or „male" cola-nut.
3. **Plants producing Condiments**: Xylopia aethiopica „Neger-Pfeffer"; Monodora myristica, with seeds smelling like nut-megs.
4. **Plants producing Oil and Fat**: Butyrospermum Parkii, with seeds yielding the shea-butter; Sesamum indicum and S. radiatum containing sesame-oil; seeds of Polygala butyracea and Moringa oleifera.
5. **Medicinal Plants**: Sarcocephalus sambucinus, the wood is used as a drug by the natives; Strophanthus hispidus and Str. sarmentosus.
6. **Plants producing perfume**: Tubers of Cyperus longus.
7. **Dyeing Plants**: Indigo.
8. **Fibre Plants**: Leaves of Phoenix reclinata, Bast of Adansonia digitata, Hibiscus calophyllus, Urena lobata, Abutilon indicum, Ficus barbidens, Sanseviera guineensis; Hairs of fruit of Ceiba pentandra.
9. **Economic timbers and Plants otherwise prominent in the Togo Flora**: Chlorophora excelsa, Dalbergia melanoxylon, Khaya senegalensis, Tetrapleura Thonningii, Bauhinia reticulata, Hyphaene togoënsis, Afzelia africana.

II. Kamerun.

1. **Alimentary Plants**: Fruits of Coula edulis; seeds of Treculia africana; „Dika-Bread", which is for the

greater part made from the seeds of Irvingia gabunensis; seeds of Pentaclethra macrophylla.

2. **Plants supplying Beverages**: Theobroma cacao (Cocoa).
3. **Plants producing Condiments**: Cinnamomum ceylanicum; seeds of Aframomum melegueta, A. citratum, A. Hanburyi and of Elettaria cardamomum; Piper nigrum and Caryophyllus aromaticus.
4. **Plants producing Oil and Fat**: Fruiting branch, fruits and seeds of Elaeis guineensis, the oil-palm; seeds of Mimusops djave and Telfairia occidentalis.
5. **Medicinal plants**: Fruits and seeds of Physostigma venenosum; seeds of Holalafia densiflora; bark of Corynanthe johimbe; Tabernanthe iboga, Strophantus gratus and S. Thollonii.
6. **Plants producing Gum and Resin**: Gum of Cynometra Mannii; Kamerun-Copal of Copaifera-species.
7. **Plants producing Caoutchouc**: Fruit, seeds and caoutchouc of Kickxia elastica.
8. **Fibre plants**: Fibres of Boehmeria nivea (Ramie); bast of Raphia vinifera.
9. **Species otherwise prominent in the Kamerun Flora:** Seeds of Omphalocarpum procerum; a neck-lace made from them. Pterocarpus Souyauxii, Alafia Zenkeri, Bombax buonopozense, Entada scandens, Eriocoelum macrocarpum, Pycnanthus kamerunensis, Oncoba spinosa, Pandanus kamerunensis, Borassus flabellifer.
10. **Photographic views** of the Victoria Botanical Garden.
11. **Timber-woods.**
12. **Fungi.**

III. German East Africa.

1. **Alimentary Plants**: Eleusine coracana („korakan") or „uimbi"; the meal of this cereal is very popular with the natives. Vigna sinensis („kundi"), Phaseolus mungo („schirokko"), Ph. lunatus and Dolichos lablab are plants somewhat resembling our beans; they are generally cultivated; the pea-like seeds of Voandzeia subterranea are produced in pods down in the earth; Cordyla africana.

2. **Plants supplying Luxuries**: Different varieties of tobacco Nicotiana tabacum, as they are used by the natives. Coffea ibo, a coffee-species indigenous in East-Africa.
3. **Plants producing Oil and Fat**: Seeds of Telfairia pedata and of Allanblackia Stuhlmannii, with the fat in the shape in which brought to market by the natives.
4. **Medicinal Plants**: Fruits of Strophanthus Eminii and other species of this genus; the seeds yield the strophantin. — Fruits of Acocanthera abyssinica are employed by the natives for poisoning their arrows. — The bark of Erythrophloeum guineense. — The barks of Parkia Bussei and Derris Stuhlmannii yielding some kino-like resins.
5. **Plants producing Copal, Resins and Gums**: Various sorts of copal of Trachylobium verrucosum. Gum of Acacia usambarensis, A. verek, A. seyal, A. spirocarpa, A. stenocarpa, Berlinia Eminii and a Brachystegia-species.
6. **Dye-Plants**: Orchil of Roccella Montagnei. Yellow bark of Ochna alboserrata.
7. **Caoutchouc-Plants**: Various sorts of caoutchouc, some produced by species of Landolphia, some by Mascarenhasia elastica.
8. **Tanning Plants**: Barks of Rhizophora mucronata, Bruguiera gymnorrhiza, Ceriops Candolleana, Xylocarpus granatum, Sonneratia caseolaris, Acacia Brosigii, Uapaca Kirkiana.
9. **Fibre Plants**: Leaves of Hyphaene coriacea; Fibres of Sanseviera guineensis, S. cylindrica and S. longiflora, Adansonia digitata, and fruit-cotton of Bombax rhodognaphalon.
10. **Timber-trees and Plants otherwise prominent in the Flora of East-Africa**: Podocarpus usambarensis, Juniperus procera, Hyphaene useguhensis, H. Bussei, H. macrocarpa, H. natalensis, H. cylindrocarpa, H. Petersiana, H. obconica, H. plagiocarpa, H. platysperma, H. ansata, H. rovumensis, Musa proboscidea and M. Holstii, Brochoneura usambarense, Polyceratocarpus Schefflerianus, Afzelia

cuanzensis, Acacia albida, Amblygonocarpus Schweinfurthii.
11. **Views of vegetation and individual schrubs.**

IV. South-West Africa.

1. **Alimentary plants**: Acanthosicyos horrida (Naras plant), the seeds of which are eaten by the natives. Fruits of Acacia Giraffae and of Sclerocarya Schweinfurthii.
2. **Plants producing Gum**: Gum of Acacia horrida.
3. **Plants producing Tannin**: Bark of Copaifera mopane; roots of Elephanthorrhiza Burchellii.
4. **Timber trees and Plants otherwise prominent in the Flora of South-West Africa**: Euclea ebenus, Acacia erioloba, Combretum primigenium, Tumboa Welwitschii (Welwitschia mirabilis), Harpagophyton procumbens.
5. View of Acanthosicyos horrida.

V. German possessions in the Pacific.

(Marianes, Carolines, Marshall-Islands, Bismarck-Archipelago, New Guinea, Samoa).

1. **Alimentary Plants**: Fruits of Pangium edule, Inocarpus edulis, Canarium Kaernbachii, Morinda citrifolia, Pandanus odoratissimus.
2. **Plants producing Condiments**: Myristica argentea, M. pseudo-argentea. — Massoia aromatica, producing the Massoia-timber.
3. **Fibre Plants**: Abroma fastuosum, Pueraria novoguineensis, Pandanus dubius.
4. **Plants employed in manufactoring buttons**: Coelococcus carolinensis u. C. salomonensis.
5. **Other Plants prominent in the Pacific Flora**: Metroxylon Rumphii, Nipa fruticans, Cerbera floribunda, C. manghas, C. lactaria, Parinarium Hahlii, Heritiera litoralis, Pseudochrosia glomerata, Gardenia Hansemannii, Calophyllum inophyllum, Pandanus Danckelmannianus, P. tectorius und P. Kaernbachii, Beccariodendron grandiflorum, Xylocarpus grandiflorus.

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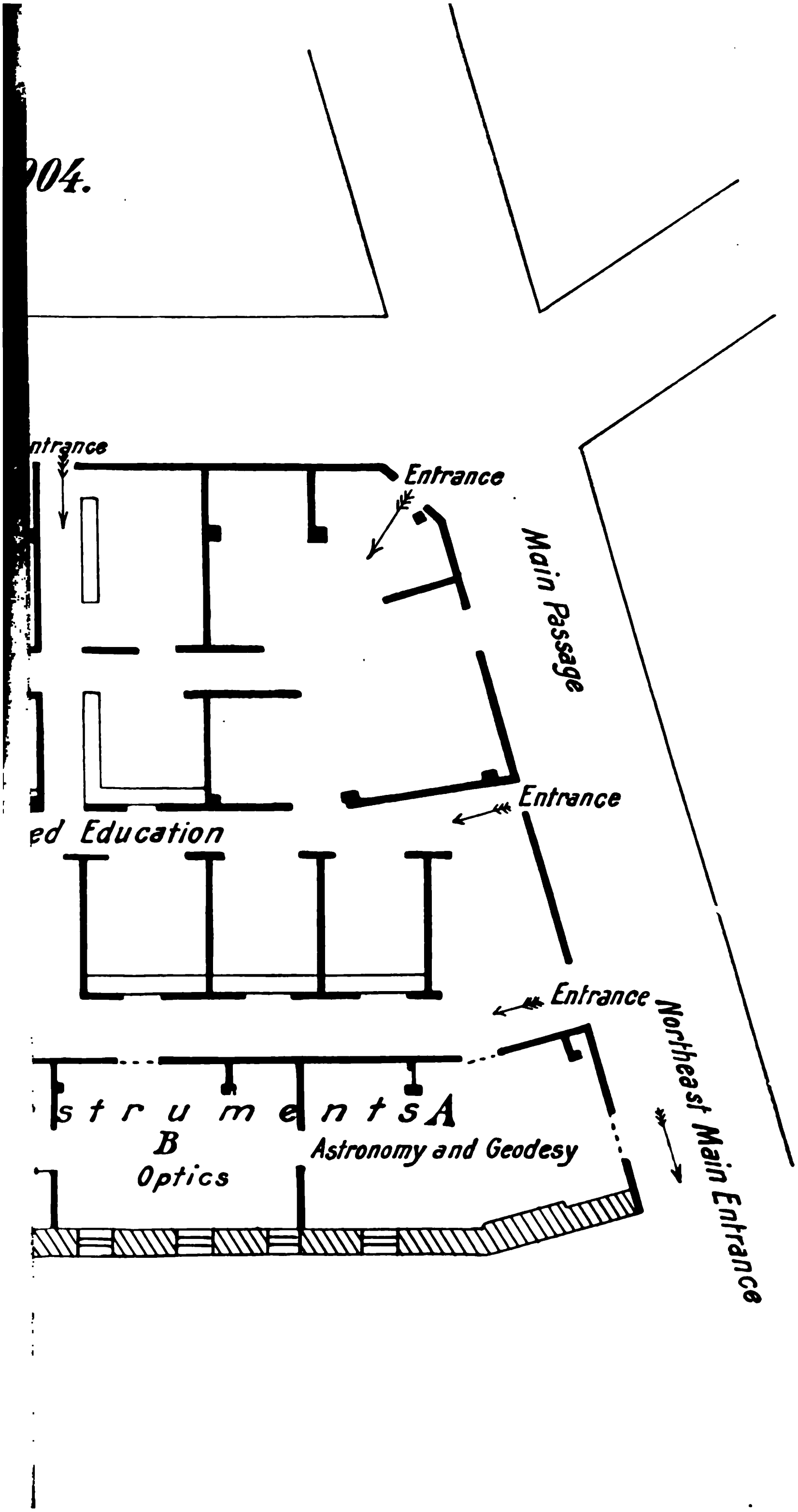

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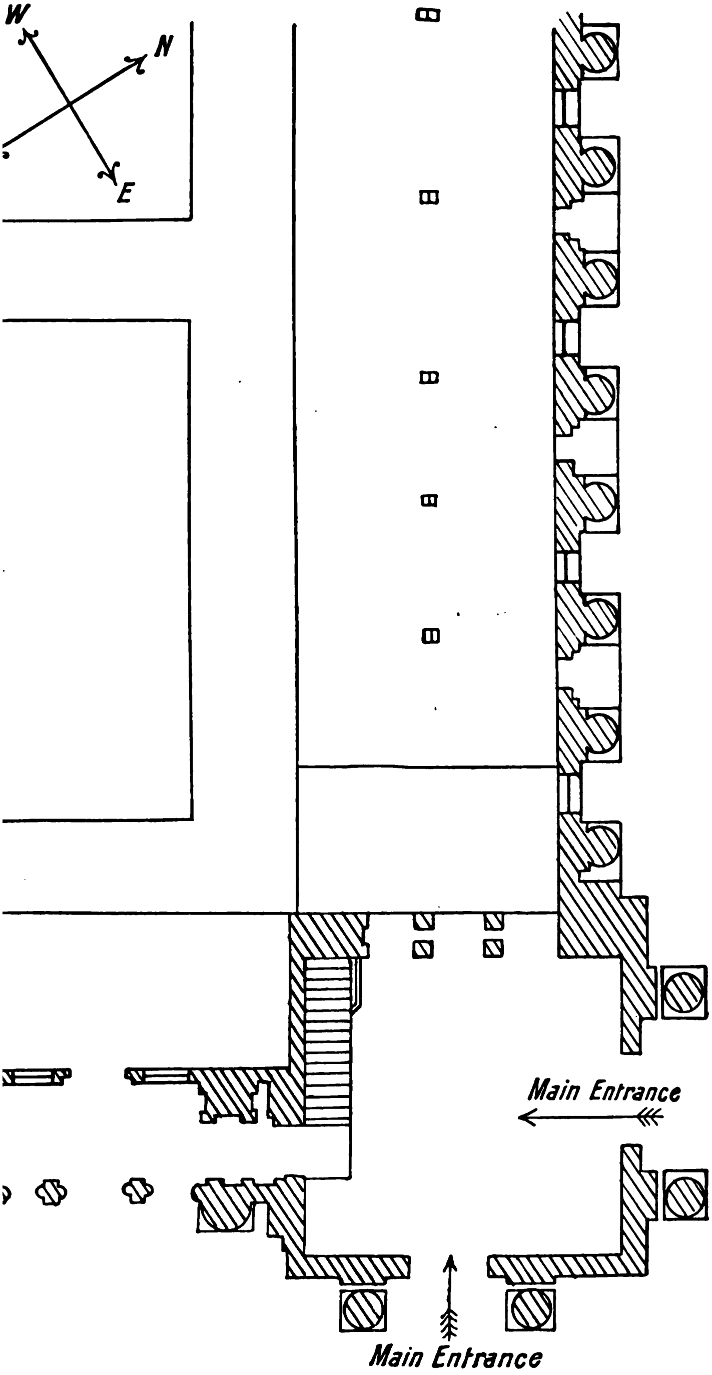

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